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XUM

UP SHIP, GENTLEMEN!

by
Comm. Jacob Klein (Retired)
as told to
JAMES FARBER

Official Photo U. S. Navy.

The venerable Navy airship Los Angeles moored to the U.S.S. Patoka.

WE sat there, he and I, snugly in our cushioned, modernistic setting aboard a Burlington Zephyr. How fast we were travelling, I know not. I can say only that we were racing through the night at aerial speed. Sleek and streamlined, the Zephyr sped on wheels touched by Mercury's bright staff.

It was one of those gladsome reunions. I had not laid eyes on him since I watched him in the gondola of the Los Angeles, with scores of men tugging and straining on guide ropes dragging to her moorings the mighty aerial pride of the Navy.

You, too, know him: Commander Jacob H. Klein, U.S.N., Retired, grizzled veteran of the Navy Intelligence Service; redoubtable skipper of a destroyer plunging through mine-infested war seas; commander at Lakehurst; first executive officer of the ill-fated Shenandoah; later of the Los Angeles.

"I'm glad to see you," "Jake" Klein said and I knew that he might have been, on this lonely, roaring-through-the-night Zephyr trek of ours. Company was a sore need of both of us. I assured him the feeling was mutual.

But you are not interested, presumably, in these trifling amenities. Just as you would have done, I began to talk shop with him. A hundred questions rolled from my tongue: did he miss the Naval service since his retirement? What did he think of our lighter-than-air activities? Would he like to be back? Did he still get a gastronomic kick out of sea food? Did he think we ought to copy German dirigible ideas? Did he think spy-catching was romantic or dangerous, or both?

"We'd better take these things one at a time," Klein smiled, gesticulating with his hand. "I see you haven't changed a bit. Always asking questions. You probably ask them in your sleep."

The Los Angeles at her mooring mast.

"I probably do," I agreed. "But anyway, let's hear about yourself."

All of which, with an occasional leading question, elicited the following story of a man who today ranks with the leading authorities on the subject of lighter-than-air craft. True, he deprecates his knowledge; but it is there, nonetheless. Time has not changed the principles involved, nor complicated the problems.

So let's look at Jacob Klein's career in detail.

When Nicholas Longworth went to Congress from the Cincinnati district in 1903, he appointed Jacob Klein a midshipman to the United States Naval Academy at Annapolis, Maryland. The youth, five-feet-four, 110 pounds, just got under the ropes. He earned the nickname "Eva" in the lavatory vaudeville shows performed as a plebe under the grilling supervision of upperclassmen hazing gangs. He was, he explains, "quite the stuff" portraying Little Eva Crossing the Ice.

Although he and several classmates from around Cincinnati tried to organize one of the first basketball teams at the Academy, young Klein was essentially a Mexican athlete of the first waters (by his own statements). That means that shut-eye and Bunk Fatigue duty were no strangers to him. Tennis and baseball engrossed him somewhat, he says.

From the grinds, pastimes, sports, lethargies and leisures of Old Bancroft

Official Photo U. S. Navy.

The Los Angeles hovering over New York, her gigantic dimensions matching those of the skyscrapers.

A Retired Officer Talks Airship

young Klein emerged, eventually, in 1907, a full-fledged Ensign of the Navy. His first sea duty was aboard the U.S.S. Rhode Island on a round-the-world cruise ordered by President Theodore Roosevelt. After destroyer duty, he became aide to Admiral Alfred Reynolds, commander-in-chief of the Pacific fleet.

Unimportant, except in a routine way, is the description the Commander applies to the years intervening until 1914 at which time he was ordered to Washington. The Navy needed a secret service of its own. It had never had one. Its operations, by way of espionage, had been negligible, its results scarcely able to compete against those of powerful foreign nations.

Rear Admiral J. H. Oliver was named at that time to head the group of six men, pioneers in United States Naval Intelligence. Klein was one. Major (now Major General) J. H. Russell, U.S. Marine Corps, was another.

When the German U-Boat Deutschland steamed into Baltimore harbor, creating a near-panic, in 1915, its commander, on lying to, forbade anyone except two customs officials from stepping aboard.

"I suppose," Commander Klein says today, "that if anyone ever gives the matter a thought, the Germans must be still wondering how we got all the secrets out of that superb craft. Well, as you've probably guessed, I was one of those two inspectors. And did we find out things! It was mighty valuable information and when we left the Deutschland, we knew plenty. Incidentally, if you publish that, it will be brand-new.

"The information carried way from the Deutschland that day was of real value to our own Navy's submarine service."

The idea that the "spy service" is glamorous is pure buncombe, Jacob Klein says. He scouts the legends surrounding Mata Hari, woman spy executed by the French army; believes they were exaggerated by writers looking for "color." Insofar as the dangers are concerned, he asserts that he didn't encounter any.

"Well," he adds, "once we captured a supposed Austrian spy—forget his name—in the lobby of the Willard hotel in Washington. He was a walking arsenal, that boy was. Had two loaded revolvers on each hip. Was I worried? Why, sure. Wouldn't you be?"

From 1914 to 1917 Commander Klein was busy helping perfect the fledgling Intelligence Service. At the outbreak of hostilities in April, he was assigned to sea duty. He soon found himself skipper of the Destroyer Joseph B. Smith, went to the Azores and then to Queenstown and was one of the first five sent to Brest for the dangerous job

Official Photo U. S. Navy.

Three U. S. Navy dirigibles, the Los Angeles and the two non-rigid airships J-3 and J-4 at rest on the field.

Comm. Jacob H. Klein, retired, as he appears today.

of convoying troopships to France. Six months after being made a Lieutenant Commander, he was made Commander along with his classmates, a near record for rapid promotion.

His war service was between Brest and Queenstown, with plenty of excitement in waters brimming with mines and submarines. He was standing by when a torpedo skimmed past the Joseph B. Smith and blew a hole in the side of the S.S. Finland. As the stricken vessel listed over, Skipper Klein was busy picking up soldiers out of the sea, drowned, half-drowned, and alive and kicking. The ship did not sink and was safely convoyed to Brest for repairs.

When the S.S. Lincoln was sunk 500 miles West of Brest, France, the doughty Commander was once more busy. He picked up 260 survivors. Today, these lucky troopers hold annual reunions—and invariably invite Klein as their guest of honor. An honor, incidentally, which he keenly relishes. It reminds him of some pretty exciting days.

But after the war, excitement and adventure were not so easy to find.

There remained the air. There always remains the air.

Thousands of men and young men have discovered that for themselves. Commander Jacob Klein, with a distinguished war record, elected to climb high for his next laurels. Being somewhat past the age at which he could be sent to Pensacola for heavier-than-aircraft training, and the Navy's lighter-than-air service being in an embryonic stage, the opportunity for Commander Klein was a manifest one. With no delay he joined the groups of Navy men experimenting with balloons, dirigibles and blimps. It was interesting work, mostly, the Commander believes, because so much of it was done "in the dark," so to speak.

The training course was a brief one. The "students" were being instructed by Captain R. Heinen, formerly of the Zeppelin Works, who had been a test pilot during the war. After the training, the "graduates" began teaching others what they knew. It was a sort of "six months a student, then a professor" curriculum. But it was the best at hand and what these pioneers lacked in knowledge and instruction, they quickly gained in experience.

In 1923 Jacob Klein was sent to Lakehurst. He was appointed executive officer (second in command) of the Shenandoah under Commander Frank McCrary. He was later promoted to be commandant of the Lakehurst station.

Then, almost on the heels of this advancement came another distinction.

As part of her Versailles reparations agreement, Germany was building the Los Angeles for the United States Navy. First of the enlarged dirigibles and now the only one, even in its decommissioned status, in possession of our Navy, this majestic vessel of the clouds was being built under the close

supervision of the noted Dr. Hugo Eckener, world's greatest dirigible pilot and engineer.

To Germany, with his expert knowledge of the language and his experience in the navigation of such craft, Commander Klein was forthwith dispatched by the Navy Department to study and understand the Los Angeles as she was undergoing her trials. It was a signal honor and came to a man well capable of discharging the duties he had to assume.

The American Commander was impressed from the first with the thorough methods employed by the Germans in building their sky monsters. He watched, he relates, with fascination the science and caution which accompanied each step taken toward the completion of the Los Angeles. He ascribes the "long life" of the craft to these very precautions, in a large measure because, he says, there was no haste, there was no waste and there was no lack of attention to every potential as well as known law of mechanics and physics, as embodied in the natural laws known to govern the science of aerodynamics.

Commander Klein was an American observer aboard the Los Angeles on its historic flight from Friedrichshafen to Lakehurst. Dr. Eckener was the actual skipper and Up- and Downed-ship until she was moored safely for delivery to this country at the New Jersey terminus. The Commander states that he more than enjoyed the opportunity to stand by while the acknowledged master of the dirigible airways brought her to our shores.

These considerations, Commander Klein says, led him to whatever criticism he has of the lighter-than-air craft development in the United States. He said to your correspondent:

"We have been hasty. Too hasty. The cost has been appalling. Germany has taken things characteristically slowly. We get too big with our ships. The Germans build one craft, increase its size gradually. Never, have they built a bigger Zeppelin by jumping its size too rapidly."

It must be remembered that Commander Klein is not in the service today. He is not bound by the rules that bind the men still in it. He can, if he likes, speak his piece. If he desires controversy, he can stir it up with no little celerity.

But your correspondent hastens to convey to you a true picture of this national authority on lighter-than-air:

He is no controversialist. He makes no criticism of those in the service unless helpful suggestions he advances from time to time might be so construed. Today he lives his own quiet life far from the madding roar of glistening props. He is content with things as they are, hopeful, like all of us, for things as we'd like them to be: national and international peace; domestic concord; the tranquillity of civil life.

(Concluded on page 54)

How the Los Angeles Racers Looked

(Photos by Robt. C. Morrison)

Art Chester's ship—The "Jeep."

Ortman's Keith-Rider—"Gilmore."

Folkert's 125 h.p. racing job.

The Crosby racer after the Thompson race.

Birthplace of the Airplane

Intimate facts concerning the Wright Brothers and the shop in which they built the World's first operative airplane. The removal of this historic building again renews interest in the landmark.

by CHARLES J. BAUER

NOT the glider, not the balloon, not Michaelangelo's sketches; nothing, in fact, more airworthy than the lowly bicycle can lay claim to the paternity of that amazing invention, the airplane.

As proof of which, witness the fact that even now a certain building, once a bicycle shop, is being removed from Dayton, O., to Dearborn, Mich., for restoration in Henry Ford's historic Greenfield Village, alongside Thomas Edison's laboratory and other famous Americana.

And on that building will be placed an inscription, doubtless to this effect: "The birthplace of the airplane. A.D. 1903."

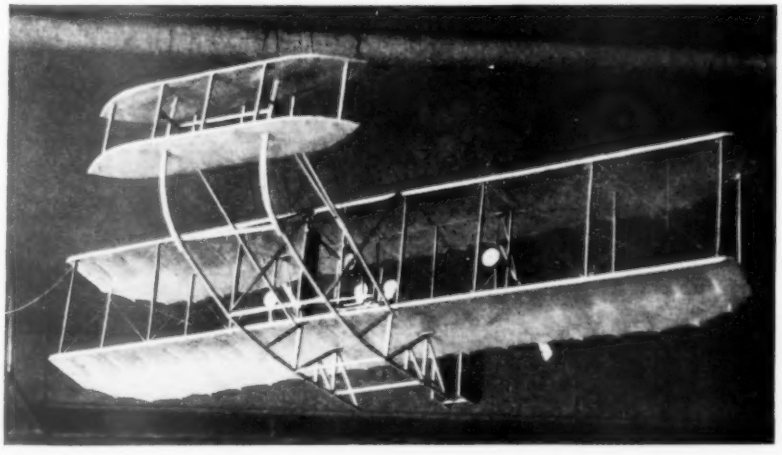
For this is the shop where Wilbur and Orville Wright, when they weren't stealing time to "fiddle with their consarned contraption that never will fly," made and repaired bicycles. They were good bicycles, too, old timers say, and in those days bicycles were all the rage.

For 33 years the building in which the Wrights constructed their gliders and first planes has been just another West Side business place, never receiving the recognition it deserved as the cradle of aviation.

And now the barber must find a new place for his barber shop, the shoe repairman must find another shop, the newspaper will seek another branch station, and the tenants of the upstairs apartments must move—just so future generations will be able to say: "This is the cocoon that gave us the man-carrying butterfly."

Here, the Wrights built their first airplane. Behind the storefront at the left was the bicycle shop with the office upstairs. The shaded portion at the right was added years later.

A closeup of the storefront occupied by the bicycle shop.



Model of the first military plane made from the wood of the wreckage. It now hangs in a highschool.

The Wrights were not the only aviation pioneers who turned from bicycles to biplanes. Glenn Curtiss, a bicycle enthusiast, once held the world record for the mile on a motorcycle, set at Ormond Beach, Fla. Henri Farman, French racer of the early days, also found flying more to his taste than cycling. There were others, too, who tried with less success but more literally, to turn from cycling to flying. Their idea was to adapt the pedaling principle to the air, either by means of propellers or flapping wings.

Wilbur and Orville Wright never tried that, but they did toy with the helicopter notion, and you may never have heard of that:

"Our personal interest in it (aerial navigation) dates from our childhood days," Orville wrote in September, 1908, three and a half years before his elder brother's death. "Late in the autumn of 1878, our father came into the house one evening with some object partly concealed in his hands and, before we could see what it was, he tossed it into the air. Instead of falling to the floor as we expected, it flew across the room till it struck the ceiling, where it fluttered awhile and finally sank to the floor.

"It was a little toy, known to scientists as a 'helicopter,' but which we, with sublime disregard for science, at once dubbed a 'bat.' It was a little frame of cork and bamboo covered with paper, which formed two screws driven in opposite directions by rubber bands under torsion. A toy so delicate lasted only a

short time in the hands of small boys, but its memory was abiding.

"Several years later we began building these helicopters for ourselves, making each one larger than that preceding. But to our astonishment, we found that the larger the 'bat,' the less it flew. . . ."

The Wrights abandoned their helicopter experiments as a result of this discovery, and only in the summer of 1896, on reading an account of the accidental death of the great gliding expert, Otto Lilienthal, did they revive their active interest in flight.

Taking their cue from Lilienthal, they concentrated on gliding, realizing that the problem of stability was a greater challenge than the problem of finding a source of power.

In fact, the first Wright patents, applied for in March, nine months before the first powered flights at Kitty Hawk, N. C., covered soaring machines as well as flying machines. Evidently the Wrights felt, even that early, that they had mastered the secret of flight.

Last summer Orville Wright observed his 65th birthday anniversary, and doubtless he reflected that he is twice the age he was when he first saw the earth slipping away beneath him as he lay prone between the lower wings of his canvas-spruce biplane, on Kill Devil Hill, N. C.

Measured in feet and altitude that wasn't much of a flight, but it is the most memorable aerial triumph in history. The plane never was more than a few feet from the ground and covered only about 120 feet in its 12-second venture.

But when Orville Wright, first to fly in a powered heavier-than-air craft, leaped to his feet, he knew, and his brother Wilbur, who ran up to the plane, knew, that at last man had found wings. Wilbur made two flights that day, and Orville also made another flight, and at the end of the day the wind picked up the light craft and destroyed its usefulness, so that it never was flown since. Today it rests, an exile, in the South Kensington museum near London.

The bicycle shop, too, goes into exile with removal and reconstruction at Greenfield Village. Soon after Orville Wright returned to Dayton from his summer home in Canada early in September, he directed the dismantling of the old shop. Every brick of it, every stick of it, was marked as it was removed, so that it might be restored exactly.

Wright spends his midsummers on a 25-acre island between Georgian and Sturgeon bays, about 90 miles northeast of Toronto. He is, for 10 weeks at least, "the lord of Lambert Island," which he owns.

Each of the past four years Wright has spent his vacation with a grandnephew, George Milton Russell, 21, of Lawrence, Kans., student of mechanical engineering at the University of Kansas. Russell's great-grandfather and namesake, Bishop Milton Wright, was father

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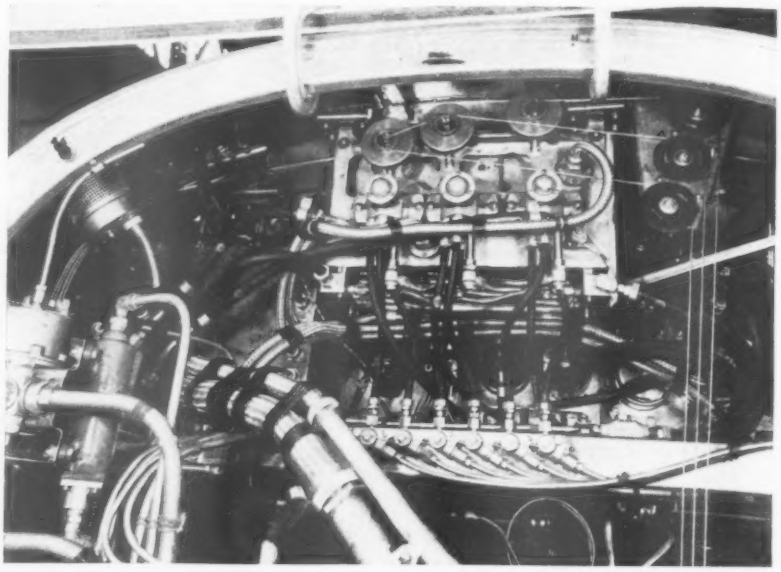
The Intricacies of Airplane Instrument Wiring



This maze of wiring and its myriad connections, is productive of a designer's headache.

JONAH may have had a glimpse of something like this on his way down the Whale's hatchway.

If he did, he probably died of fright. But there's nothing to be afraid of here. We are looking smack into the open snout of one of American Airlines' new Sleeper planes, which gives us a first class view of the back of the instrument panel.

The collection of machinery packed into the left-hand corner is all part of the automatic pilot system. Just to the right of that are two heavy cables. They carry all the connections to the electrical instruments which are mounted in the sheet metal box just behind the automatic pilot machinery.

In the top center of the picture is the famous "brain" of the automatic pilot. The sensitive gyroscopes which detect any tendency of the plane to move from straight and level flight are housed in this case.

The three cables on the right side of the picture are called "follow-up" cables. They stop the action of the automatic pilot so that it does not overcontrol the plane. There are 35 instruments mounted on this panel.

Canadian Transcontinental Airmail Nears Completion

WITH air mail poundage for the past year nearly double that of the record year of 1934, the early operation of a trans-Canada air mail service looks favorable. The latest information from Ottawa is to the effect that a decision is now being made as to whether the mail service will be publicly or privately operated.

Air mail poundage everywhere has been on the increase in recent years, with the steady operation of old routes and the opening of new routes. In Canada inter-city air mail services were scrapped in 1931 and 1932, and at present there are only three all-year air mail inter-urban routes functioning, those from Montreal to Albany, N. Y.; from Winnipeg to Pembina, N. D.; and from Vancouver to Seattle. In winter there is the Moncton, N. B., to Charlottetown, P. E. I., service. Other services into remote sections total 27 routes.

The trans-Canada airway under present plans will operate for at least a year purely as an air mail service, running parallel to the northern United States transcontinental airway route. Later when the route is functioning smoothly, passengers will be carried. An eighteen hour mail service is nearly ready to function from Halifax to Vancouver. From a military as well as business viewpoint, such fast service is beneficial to all parts of Canada, but the route is not at present designed for military reasons, especially since many sections of it run too close to the international border.

The route as at present planned will start at Halifax, go via St. John, across the state of Maine, to Montreal. From Canada's largest city the mail will fly to Ottawa, to Elmsdale, where a feeder from Toronto and Buffalo will join the main route. Then Elmsdale, Cobalt, Nakina, Sioux Lookout, to Winnipeg, far north of the lake region to keep away from fogs. From Winnipeg the

(Concluded on page 70)

The "Uniplane", an All-Wing Type

by RICHARD B. JOHNSON

A recent and most interesting Chicago development with a single plane serving all functions of lift and control.

AMONG late developments in aviation is the low aspect-ratio airplane, sometimes called the "all-wing" or the "flying-wing" type.

This specie of aircraft has been developed by several individuals independently of each other. Design conceptions took place before publicity on any one design, giving several original approaches to the same goal, a safer airplane.

Dr. Snyder of South Bend and Raoul Hoffman were out first with the Arup, a half-circle planform wing. Then came Steven Nemeth of Chicago with his umbrella or pancake type, a true circular planform placed above a conventional fuselage. A few months later the Uniplane, another Chicago design appeared ready for test flights. This conception appeared to be a cross between a pumpkin seed and a mud turtle, with apparent ancestral connections with the bat family.

Of these three designs, the Uniplane was perhaps carried to the greatest aerodynamic extreme, having an aspect-ratio of 1.1, which to the layman is the ratio between the wing span and the fore and aft wing dimension. This ratio is normally 6 on conventional airplanes, and anything less has always been considered inefficient and impractical.

While admittedly inefficient, there is now a good deal of reason to believe it is far from impractical, for low aspect-ratio has one fundamental saving grace if no other—an inherent abhorrence toward breakdown of airflow at angles of attack twice what the conventional plane will survive.

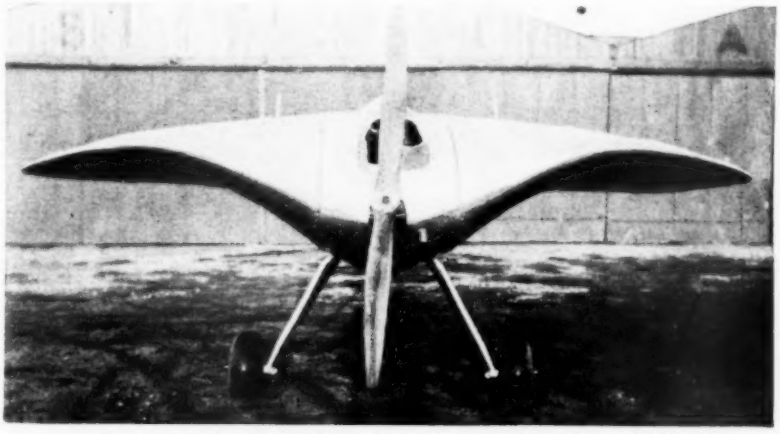
The significance of this airflow phenomena is of great importance, for it means relatively safe aircraft performance can be obtained without recourse to costly and complicated mechanical aids such as slots, flaps, and rotating airfoils, by the simple method of reshaping the wing planform.

As if this were not measure enough, the same redesign of planform gives virtually inherent spinproof qualities, with aspect-ratios below that of a true circle apparently absolutely spinproof according to available data.

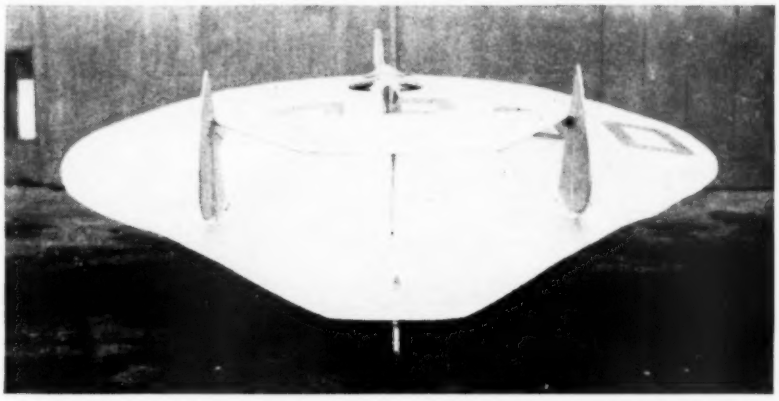
The above mentioned qualities, however, are not the sole ones to compete with so-called efficiency qualities of a conventional airplane; an efficiency incidentally which is inefficient in lives and material losses. Structurally, an all-wing type of construction is possible, resulting in a unified, compact aircraft, free from any possibility of serious major structural failure in the air.

This same quality allows for lighter construction, greater available space,

Three Interesting Views of the Uniplane



Straight front view of the Uniplane showing self-supporting wings and clean flowing lines.



Rear view of Uniplane showing the smooth horizontal surfaces and the twin vertical rudders.

Here we see the cockpit and the disposition of the horizontal surfaces. The horizontal flow of air is not interrupted from the leading edge to the extreme rear edge of the surface.

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and greater proportionate payload. Aerodynamically, parasite resistance can be virtually exterminated, for the wing can house engines, cabins, and landing gear.

This advantage is cancelled to some degree by the greater wing resistance, which, however, is a favorable compromise, aerodynamically. Economically, it is cheaper of construction, less expensive for storage, and less expensive for flight instruction as landing skill requirements are considerably reduced. This economy is nullified to some degree by greater horsepower requirements.

From the standpoint of safety, a quality which should lead all others, this type of design can not be surpassed in a structural sense. Aerodynamically, only the autogiro lands slower and is safer against stalls and spins.

The above analysis is based partly on preliminary wind tunnel tests made by the National Advisory Committee of Aeronautics and partly on experience obtained from actual construction and flight tests of the single place experimental Uniplane.

This ship, its design, construction, and test flights have been a leisure time pursuit by a single individual, and its development has been handicapped by one mind, one pair of hands, and one meager income, which may account for its faults and unsensational performance.

Finished in September, 1934, the Uniplane made its public appearance with an oval or egg-shaped planform. The wing length or maximum chord was 16 feet and the span was only 14 feet, giving a wing area of 183 sq. ft. The 3 ft. thick center section enclosed a Heath fuselage which served as the major structural member.

A Church converted motorcycle engine was cowled into the wing. This engine was rated at 41 horsepower at 2800 r.p.m., but more than 2600 r.p.m. could not be expected of it when swinging a propeller of suitable diameter for the Uniplane's requirements. This left no margin for reserve power, which accounts for the half-dozen forced landings experienced over the past two years.

The cockpit, placed some four feet back from the leading edge, was entered by a rather precarious walk up the rear of the ship. This required a good deal more skill than actual flying of the Uniplane. Windows in the lower wing sur-

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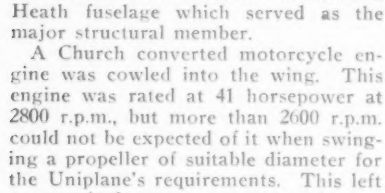


The Uniplane taking off on one of its flight trials.

Dope on the New Pitcairn Autogiro

by ROBERT LUNCH

The Pitcairn Autogiro drawn up to the curb in front of the Department of Commerce Building. Note the rotor blades folded back for transport or storage.

CAPABLE of landing in 30 feet, a top speed of 90 miles per hour, and able to be put into an ordinary garage, the newest addition to the lightplane program here of the Bureau of Air Commerce, is the Pitcairn autogiro.

The autogiro is able to take off in less than 150 feet, with no wind, with a landing speed of 20 miles per hour. The distinctive feature of the autogiro is its roadability, which was demonstrated by Mr. James G. Ray, veteran autogiro pilot and vice president of the Autogiro Company of America, Philadelphia, builders of the craft, in his trip through the streets of Washington to the front door of the Commerce Department Building.

The craft is designed for operation on the highways after it has landed, or on its way to a field for a take-off. This has been accomplished by providing rotor blades which can readily be folded back over the fuselage, a clutch between the engine and propeller so that the propeller may be disconnected from the engine, and a power drive from the engine to the tail wheel so that the autogiro becomes practically an automobile for ground operation.

This feature makes it quite possible for the private owner to house the plane at home and drive it to the nearest suitable field for take-off, or land on a field near the point of destination and proceed over the highway.

As the autogiro lands and takes off in a limited space, a large airport is not even necessary—a clear field will serve. The advantage to the private owner is apparent, since the autogiro may be stored at home in a typical automobile garage, and operated from the nearest, clear, level field.

The other day, Mr. Ray landed in a small downtown Washington park just north of the Department of Commerce building, and in a few moments, by folding the rotor blades back over the fuselage and engaging the tail wheel to a drive from the engine, the autogiro was made "roadable."

Mr. Ray then drove down the street to the front entrance of the Commerce Department Building, where the craft was formally delivered to Eugene L. Vidal, Director of Air Commerce, for acceptance flight tests here, in the presence of Secretary Daniel C. Roper and Colonel J. Monroe Johnson, Assistant Secretary of Commerce.

With Mr. Ray in the craft when the landing in downtown Washington was made was John H. Geisse, Chief of the Development Section of the Bureau of Air Commerce, under whose direction the specifications were prepared and construction of the autogiro was carried out. The autogiro is one of six experimental aircraft manufactured for the Bureau by various companies, as part of its development program for private owner aircraft types.

Pilot and passenger sit side by side in an enclosed cockpit in the Pitcairn Autogiro, equal to that provided in the average automobile coupe. The engine is mounted in the rear of the seats, making for good visibility ahead, and the propeller is in front. Transmission mechanism is provided to bring the rotor up to speed preparatory for flight, and to divert power to the rear wheel for travel on the ground.

This ship is the latest addition to the development program instituted two years ago by Mr. Vidal. The Pitcairn company has had the roadable 'giro under contract for more than a year.

The Bureau of Air Commerce development program is seeking more economical, safer private planes than exist today. Already developed for the Bureau are the Hammond, Weick, Waterman, Curtiss-Wright Coupe, Ford-powered Arrow and now the roadable autogiro.

The roadable 'giro can be stored in any garage and takes up less space than a good-sized automobile.

Veterans Organize Balloon Unit

by HELEN WATERHOUSE

There have been many aviation units in the Legion consisting of airplane pilots, but at the recent convention, the ex-balloon and sausage manipulators formed a unit all their own which packs plenty of vim and vigor.

THE entire gamut of human emotions is sometimes chronicled in one brief, dry item on a war-time record sheet. And from this item can spring tales of valor which live through the years.

It is thus especially with the records of those unsung heroes of the World War, the "sandbaggers," who were the eyes of the army as they went aloft over the war-time battle front.

A group of men, who probably risked their collective necks more often and who undoubtedly saw more actual combat than any other group of the service, these balloon veterans, have formed into a society known as the National Association of Balloon Corps Veterans.

Recently, at the National Legion convention in Cleveland, Ohio, they met to elect officers, and to hobnob in a special headquarter's room where many of the pictures and old records of their days spent in the elephantine sausage balloons were on display.

Just one of these records, taken at random, gives the picture of the branch of the national defense which these graying veterans will never forget.

"Balloon ascended 7.05. Observer Lt. Dwegan. Enemy balloon reported burned at 6.47. 11.12 began adjusting battery. C-60th-CAC on target. 368.9-245-35. 20 shots fired—1 completed, 12.14; all shots observed. Balloon attacked and burned by enemy plane; observer jumped; landed safely; changed station to 371-243 and prepared to inflate balloon. One ascension; one adjustment; no liaison; no gas used."

"Simple little record that," says Major Hal E. Dungan, looking over your shoulder as you sit in the Balloon Association headquarters where the veterans of the bag warfare mill in and out with their wives and sweethearts.

"No gas used." If they could have bottled all the gas that was used that day, they could have inflated several rubber cows. Sometimes the air was blue with it.

"That happens to have been one of my entries," he added, pushing back a bright red helmet, a badge of the Legion convention.

"That was written out on the St. Mihiel sector. I had been pushing that old balloon over and round all kinds of obstacles in order to get it into advanced position at dawn. I ascended at 7:05 and at 12:14 the balloon was attacked and burned by an enemy plane. I wish I could remember how many times in that five hours and 7 minutes, I swallowed my heart and held my legs apart in order to keep them from cracking up against each other.

"At certain altitudes, we were down very close to the line of trajectory of our own heavy artillery. I saw Tours aflame and counted 17 French towns smoldering. Then the Hun battery began shelling our division. I could look right down into the mouth of those cannon. And I was just thinking how glad I was that I was in a balloon and not on the ground as I saw those ostrich eggs whizzing over. But I was congratulating myself too soon.

"For I was interrupted by a violent jerking—and a sensation of falling and of wild clawing. I found myself in the rigging of my balloon. I had a death grip on the suspension bar of the basket and saw an airplane falling a few hundred feet from the winch. A Salmson plane of the 91st aero squadron had flown too close, hit our cable and severed a wing. It went crashing to the ground killing the entire crew.

"I hauled our bag down for inspection of the cable, then went aloft again. The first inkling that I had of being attacked was when Sergeant Carr's voice yelled that a Fokker was attacking our balloon from the north at an altitude of 5,000 feet. 'Prepare to jump,' said Carr. So I jumped. The blazing inferno that had been a balloon came so close to me as I fell, that it wasn't funny.

Here they are, the hydrogen gas boys who specialized in lighter than air craft, keeping up-to-date with POPULAR AVIATION.

"Well, that's all water under the bridge, and here we all are today—safe and sound," he finished after a little pause.

Major Dungan's experiences could be duplicated hundreds of times by other stories culled from those club records. He could duplicate them himself for he was shot down three times by German planes over Chateau Thierry, and on one of these occasions the wind carried his chute over the barbed wire into the German territory, whence he fled back to his own trenches, the shots from enemy guns fell around him.

"I felt like a clay pigeon at a duck hunt that time," he recalls.

Dungan has the Distinguished Service cross for his record in heavier-than-air service as well, having shot down four enemy planes and three enemy balloons. "I got the cross when I went into a dogfight and dived into a German formation of five ships" he says briefly.

Dungan and several of the other members of the Balloon association, including Craig Herbert of Philadelphia, were members of the first air service unit of any kind which went out to the front at the beginning of the war.

That was the famous Second Balloon company.

Herbert, incidentally, is organizer of

the National Association of Balloon Corps Veterans.

"I felt that we balloon men were getting kind of a dirty deal because we had no regimental affiliations and because we had more or less become the 'forgotten men of the army' and at Legion conventions any mention of the balloon service usually brought a chorus of 'never heard of it.'"

"So the summer before the 1932 convention at Portland, Oregon, we formed the association. We felt that this branch of the national defense should be on record for the United States army and navy, just as much as any other service. I was the first national commander. Carl D. McCarthy of Kempton, Ind., was the second. Our membership today runs into thousands.

"Observers act as vice-commanders and each has jurisdiction over a division of the country. Contact between members is maintained through a bi-monthly newspaper, called 'Haul Down and Ease Off'."

The first local chapter "Balloon Bed No. 1," was instituted at Omaha, Neb. Today, locals in all of the 48 states are sending delegates to the convention.

Roland C. Caley of Lakewood, Ohio, was elected the new national commander of the organization at the present Legion convention. He says he was the sixth American soldier in uniform on the first boat which transported troops across. He served seven months in balloons over the Champagne sector.

The Association numbers many famous men in its roster.

They include: Clarence Chamberlin, trans-oceanic flier who was an officer in the balloon corps; Roscoe Turner, aerial speed king who served with the Fifteenth balloon company, and Capt. Ashley McKinley, photographer with the Byrd Antarctic expedition, who commanded the 12th balloon company.

Lincoln Ellsworth, polar explorer, and William Benswanger, president of the Pittsburgh National League baseball club, are other members.

Capt. Orvil Anderson, stratosphere flyer, and Gen. Oscar Westover, chief of the United States Air Corps, were war balloonists and thus are members. United States Senator Edward R. Burke of Nebraska, commander of the 66th balloon company, is also a member.

When America entered the world war, it boasted no balloon service. Within a month, however, the first army balloon school began training recruits at Fort Omaha, Nebraska. Many of the men present at the balloon headquarters in Cleveland were old Omaha men. A few members of the Missouri Aeronautical Society, several technical advisors, and an assortment of circus parachute jumpers, formed the nucleus of the first wartime balloon squadron. They were trained by a handful of West Point graduates.

At Wingfoot Lake, near Akron, Ohio, the navy boys were meanwhile taking balloon training in Goodyear-built

(*Concluded on page 60*)

The Model C17B Jacobs Powered Beechcraft

(See Front Cover)

This three-quarter view of the Model C17B Beechcraft shows the characteristic negatively staggered biplane wings and the deeply filleted connections.

WALTER BEECH'S competitors have something to worry about in the form of the above Model C17B Jacobs-powered biplane. This ship also is the latest addition to the Berryloid fleet of color designs for modern aircraft.

This Beechcraft has a cruising speed of 177 miles per hour at 7,200 feet using 210 of the engine's 285 available horsepower. The ship's cruising range is 700 miles, its landing speed listed as 45 miles an hour and is capable of getting 9½ miles per gallon of gasoline. Standard equipment includes an electrically operated retractable landing gear and wing flaps.

The Beechcraft lends itself admirably to the needs of the flying business man. This particular ship shown above carries five persons including the pilot. High performance at high altitudes makes the Beechcraft one of the most popular of present-day "medium priced" airplanes.

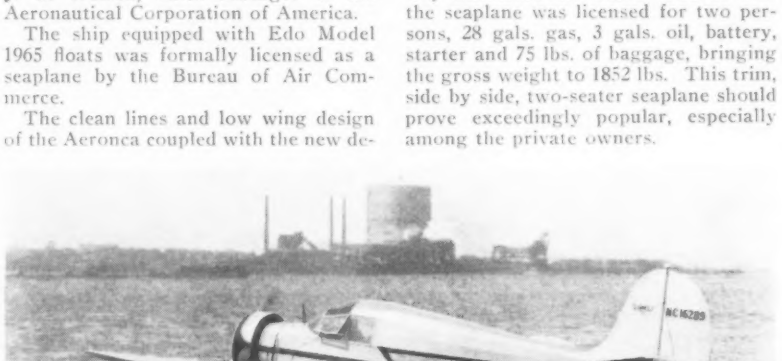
Wings are fabric covered and of the built up truss type. The fuselage is all metal tubing and is covered with fabric and aluminum. Fully loaded, the Model C17B weighs 3,150 pounds.

The Low Wing Model LC Aeronca Seaplane

THE low wing Aeronca Model LC, powered with Warner 90 H.P. engine, was test flown as a seaplane by J. C. Welsch, Sales Manager of the Aeronautical Corporation of America.

The ship equipped with Edo Model 1965 floats was formally licensed as a seaplane by the Bureau of Air Commerce.

The clean lines and low wing design of the Aeronca coupled with the new design streamline floats made a very pleasing combination. The substitution of the floats in place of the wheels in no way decreased the useful load so that the seaplane was licensed for two persons, 28 gals. gas, 3 gals. oil, battery, starter and 75 lbs. of baggage, bringing the gross weight to 1852 lbs. This trim, side by side, two-seater seaplane should prove exceedingly popular, especially among the private owners.



The LC Aeronca on floats is a mighty neat looking little job with an excellent performance.

The Deutsch de la Meurthe Race

By R. C. WOOD

A detailed description of the 1936 event of this European air classic in which interesting planes and engines were flown. The author, Mr. Wood, by the way, is a member of the National Air Board.

THE Fourth Annual Contest of this Speed Classic for single seater planes, equipped with engines of a total cylinder displacement of not more than 8 liters (488,8 cu. ins.) was flown at the Mondesir (Etampes) Aerodrome, situated about 40 miles south of Paris.

It was divided into two sections of 1.000 kms. (625 miles) each with an hour's interval between them, and took place over a closed triangular circuit of 100 kms. (62½ miles) in length with equal sides. There were three entries.

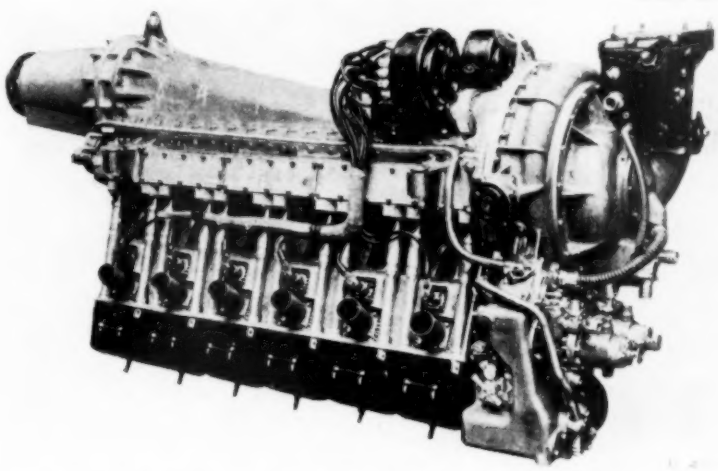
The contest was won by Yves Lacombe, a Caudron pilot who flew a low cantilever wing single seater Caudron monoplane at an average speed of 389,46 km.hr. (233 m.p.hr.). His plane was of 1934 construction fitted with a fixed undercarriage and with the small closed hood which served as a wing shield over the pilots' seat protruding several inches above the level of the top of the fuselage.

Maurice Arnoux, winner of the 1934 Deutsch Cup, another Caudron pilot, finished second at an average official speed of 369, 15 km.hr. while the third entry, Raymond Delmotte, chief Caudron pilot and winner of the 1935 Deutsch Cup, abandoned the race at the end of seventh round owing to trouble with one of the exhaust pipes of his engine.

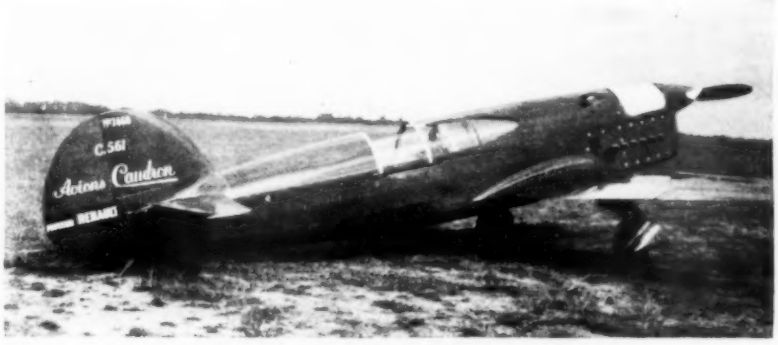
Both Arnoux and Delmotte also flew Caudron low cantilever wing single seater monoplanes but having a new highly streamlined fuselage of 1936 design and equipped with retractable undercarriages. All three planes were powered with Renault Deutsch Cup type, 6 cylinder inline, inverted, air cooled direct connected supercharged 350 HP. engines, which turned in the Race at about 3.000 to 3.100 r.p.m. thus giving somewhat over 300 HP. each.

At the beginning of the second section of the Race, after the one hour of rest interval accorded by the rules, both Lacombe and Arnoux had trouble starting their engines, Clogged air pipes delayed Lacombe some ten minutes and Arnoux about half an hour before they were able "to take off." As the speed in the Race was officially calculated according to the elapsed time of each pilot after the starting signal had been given him, the speed shown this year was considerably less than that in the 1935 Contest.

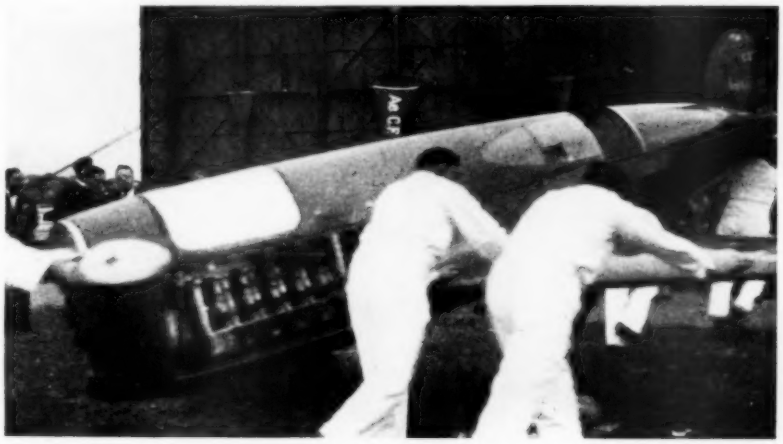
The form of the new 1936 fuselage equipping the Caudron planes piloted by Arnoux and Delmotte attracted considerable attention. Instead of the former straight vertical sides with the elliptical shaped bottom and rounded top



The new Renault 12-cylinder inverted "Vee" type engine with two banks of cylinders. It is a geared, super-charged air-cooled engine rated at 450 horsepower. Displacement 488.8 cubic inches.



Low-wing Caudron monoplane with 1936 fuselage.



A new single-seater Caudron equipped with the 450 h.p. Renault engine.

which all the Caudron racing planes have been built up to this year, and with one of which Michel Detroyat competed recently at Los Angeles, the new long narrow 1936 fuselage has a distinctly oval form.

The pilot's seat in the center of the plane has been lowered and the wind shield hood has likewise been lowered so that its top now corresponds to that of the fuselage. As the dimensions of both the 6 cylinder and the 12 cylinder Renault inverted air cooled engines are within those of the fuselage, a well streamlined form can be attained throughout the whole length of the plane. The fuselage, as formerly, is covered with plywood, overlaid with fabric, well varnished and polished.

The surface of the vertical stabilizer, which has a semi-circular shape, has been slightly enlarged and the directional rudder constitutes almost half of it. The same thin trapezoidal shaped wings, equipped with split flaps, as in the former planes, have been retained and small wing fillets have been used at their junction with the fuselage. The landing carriage is retractable, the wheels folding into the fuselage.

It had been intended, had time permitted, to attempt to establish a new 100 kms. speed record with one of these Caudron planes (1936 fuselage) equipped with the Renault 12 cylinder, inverted in V form at 60°, air cooled, supercharged and geared 450 HP. engine, which was also making its first public appearance.

As the bad weather had delayed the start of the Cup Race, however, until so late this was found to be impossible and Delmotte, the Caudron Chief Pilot, had to content himself with a short demonstration flight of this engine which turned perfectly.

The General Characteristics are as follows:

Power at ground level.....450 HP.
Cylinder displacement .....
.....8 liters (488,8 cu. ins.)
Bore .....96¾ m/m
Stroke .....90 m/m
Speed of shaft, 4500 r.p.m.
Speed of propeller, 3000 r.p.m.
.....geared ⅔
Speed of supercharger (blower).....
.....28,500 r.p.m.
Compression ratio 6,4:1
Weight, 318 kgs.....(699,6 lbs.)
Maximum height .....750 m/m

The cylinders are mounted in V form in two inverted rows. At 60°. It is expected that this engine will figure prominently in races next year.

With American air race officials pondering the threat of the more progressive foreign racing pilots who have cast their eyes upon American meets for the first time, air races of the next few years should prove to be some of the hottest fought battles for aerial supremacy of recent years.

Detroyat's unbeatable showing at the recent National Air Races in Los Angeles left American racing pilots with a serious problem to ponder over between now and next year's National Air Races.

The Douglas DC-2 Reaches 130 Mark

Rear view of the Douglas Czechoslovakian plane.

ITS two Cyclones thundering defiance to the elements, the Douglas Aircraft Company's 130th DC-2 transport recently eased gracefully into the air on its first hop, slightly over two years after the first of the now famous all-metal, stressed skin transports was placed in operation. During those two years airlines operators in the United States have added 60 DC-2's to their fleet of fast transports to give this country the most efficient system of air transport in the world.

If the Douglas Company has built 130 DC-2's, and only 61 are in operation on commercial airlines in the United States, where are the other 69 planes?

Eleven of these airplanes are in use in the United States by other than commercial operators. The United States Navy has four and the Army has four.

The Navy uses its quartet for utility work. Brigadier General Andrews, Commanding Officer of the G.H.Q. Airforce, flies one of the Army's DC-2 transports on his frequent tours of inspection from his base at Langley Field, Virginia.

The Secretary of War follows suit in the special job which was recently delivered to him. Three ships are operated by private owners or concerns, one of which is the Standard Oil Company whose plane was lost in the Great Salt Lake several months ago. The plane was later located and recovered.

Of interest is the number of foreign countries which are operating these American built transports. The list reads like a roll call at the League of Nations. Pan American Airways operates nine DC-2's and Pan American-Grace five in South America and Mexico. The Dutch are the outstanding operators of Douglas transports with 21 in service. Swissair owns 6 DC-2's, L.O.T. (Poland) has 2, Lufthansa operates one, and Holyman's (Australia) has one. Others are in use in Japan, Czechoslovakia, Russia, and Spain. Recently two DC-2's were shipped to China for service with the Canton Air Force and the Nanking Government.

"He's a fine flying student but as a speller, phooey!"

Kiss Me, My Hero Birdman

by WILLIAM L. HOPSON

Another hilarious episode of the days gone past as recounted by one of the old-timers in aviation. Read and chuckle.

MR. WEBER APPEL, short, stocky moon-faced manager of the Boise Flying Service, used to be a barnstorming Jenny jerker.

Mr. Appel does not fly any more. Four crackups, one of which left a beautiful little scar right between his eyes where he conked himself on the thinly padded rim of a Jenny's cockpit, finally convinced the chief mechanic of the said Boise Flying Service that he really could have much more fun playing around with the innards of a balky motor.

Mr. Appel might be remembered as the gentleman who, in company with another barnstorming gentleman, a Mr. Hugh Barker, almost knocked off the dome of the Capitol building in Boise one afternoon when they came gliding in for a landing.

It seems that *each* thought the *other* was doing the flying.

But this story is not of Mr. Appel's crackups, nor is it of the close shave he gave the governor's chief place of business—thrilling though these incidents undoubtedly were. It deals with the time that he played hero and pulled a rescue that would have done credit to a Tom Mix thriller. Only there the resemblance ends.

The chief difference between Mr. Mix and Mr. Appel lies in the fact that the former frequently rescued beautiful young ladies, but all the latter ever rescued was a dumb parachute jumper—a crackpot by the name of Mr. Hopson, in case you're interested.

The other difference was that Mr. Mix always took the rescued heroine in his arms, gazed soulfully into her wide and trusting orbs a moment—and then literally unlaced her shoes with a luscious osculation. But did Mr. Appel take me in his arms, gaze soulfully into MY eyes and then kiss me passionately?

Gentlemen, he did *not!* Get a load:

Many loyal readers of POPULAR AVIATION might recall the lusty account of my first attempt to jump from a plane and how, being an ambitious young man anxious to make good in the eyes of my new employer, Mr. Appel, I tried to do it from the spreader-bar of the landing-gear. They probably will recall how my ambitions were somewhat cooled when the motor got hot and conked out. I got tangled up in my chute and the landing gear and the pilot set the plane down in a freshly-cut wheat field with me hanging hands down from the spreader-bar.

Although I still *wince* when I think of that sharp *stubble* and what it did to the south end of a perfectly good pair of pants, I claim the unique distinction of being the only man in the world who had his sitting down apparatus used for an airplane landing field.

And now, after four years, I continue the story:

We finally got the motor going again, my 'chute untangled, and the dirt and wheat stubble cleaned out of my pants. That done, I went up and, scared speechless, bailed out at twenty-eight hundred feet with the old homemade 'chute I had bought for twenty dollars. The next day at noon we left Cambridge and headed across country for Boise.

We didn't go direct. On the way we stopped off at a little place, Ola, I believe, and started hopping passengers. Unfortunately, though, the landing-gear went bad after the second load and we had to quit. It seems that a certain forced landing the day before had cracked a strut or two. So I told the assembled Olaians that if they'd make up a purse of twenty-five berries I'd go up and bail out.

Let us introduce you to the author, Bill Hopson with his working clothes on, all ready for the big job.

One farmer, who appeared to be a local Caliph, yanked off his hat and got busy and before you could say Jake Robinson the purse was made up—and I had another of those queer feelings in the pit of my elley-bay. But up I went, and off the wing I went.

The old 'chute opened her ancient folds nicely, the pilot turned and headed for Boise to get home before dark and I shoved up my goggles to watch about nineteen long-legged gals leap ditches and dive through fences in desperate efforts to get to the place where I was supposed *not* to land.

Lord, how those farmer gals could run! I suppose it has no place in this narrative, but I'll bet that the citizens in and around Ola had no need of guns to kill off jackrabbits. They probably let the girls run 'em down.

I made a somewhat undignified landing right in the midst of the feminine sprinters and about a quarter mile from where the crowd were. While I was rolling up the 'chute my rescuer-to-be, Mr. Appel, came rattling up in his "service car," an ancient and topless Model T touring car whose back seat was crammed with oil cans, funnels, spare tires, a slightly cracked prop and a few other odds and ends. We piled in; I waved nonchalantly to my admiring audience and Mr. Appel started taxying the battered product of Hank Ford's creative genius in the general direction of Boise.

We spent most of the next day working on the landing-gear; though I took time off to hurry into town with twenty-five dollars of my hard-earned money. I had on a pair of Mr. Appel's spare trousers, my late ones having too much southern exposure to be of further service.

When I returned to the field an hour later, Mr. Appel's pantaloons were tucked under my arm and I was resplendent in a shiny pair of whipcords and—joy of joys!—a pair of glistening English riding boots that sent thrills of ecstasy through me every time I looked at them. The whipcords had set me back five dollars, the boots nineteen seventy-five, and I had two bits left, though little I cared.

Hot ziggety zam! People would *know* I was an airman now!

So, the next morning, Mr. Appel and I headed off across country in the Ford real early toward a little one-horse town and its one-day fair. I don't recall the name of the town, but I do recall it had a river full of cold water. Bear that in mind, gentlemen!

"Now, Tex," directed Mr. Appel when we arrived, "there's only two fields here that we can use. One is right beside the river and the other about a half-mile over by that hill. You go to the other one and pile up some brush, and when Ritchey comes over you light it so he can find the field. I'll do the same here."

So I went over, piled up the brush as directed, then lay down beside it and went to sleep. When I woke up two hours later Ritchey had been down at the other field for an hour and was wondering where *I* was.

The field that we decided to use was but a short distance from where the celebration was being held. Unfortunately for me, the two were separated by a hundred feet of sluggishly-moving

XUM

river water. But with a red bridge connecting the two we did a good business with passengers until that afternoon at four when I went over to pass the hat for the jump.

The local gentry were friendly and in generous spirit and I soon had a fair purse; after which I went to the more serious business of packing my 'chute. And if I do say it myself, I made a dashing figure as, in shiny boots and trim whipcords, I laid out the old umbrella on the grass under the awed gaze of two hundred spectators, many of them lusty-looking belles, and went to work.

I never did use a canvas bag. All I had was an arrangement of ropes and rings that would take five pages of narrative to explain how they worked. Now I straightened out the panels and shroud lines, folded the 'chute in accordion folds, carefully laid the shroud lines back and forth with newspapers between them to prevent fouling, and fastened the ropes in place.

When I finished all I had to do was pull a bow-knot, jump off backwards—and that was that. All this time Mr. Appel was telling others out at the field across the river how wonderful it was to fly like a bird—at five berries a fly.

Came the dawn—no, it was afternoon, wasn't it?—and time for the hero to do his hair-raising descent. I lugged the 'chute over to the field, took plenty of time to fasten my helmet straps and instruct the pilot (while the crowd gazed on admiringly) and finally piled in. The pilot gunned the motor and in a cloud of dust we popped off down the field and into the ozone.

He cut the gun at two thousand and directly over the ant-like figures getting a bad case of sunburned tonsils in the street below and off I went into space. I always went over backwards off the trailing edge of the left wing and since that old 'chute hung on my stomach, it always gave me the damndest feeling to watch those shroud lines and cloud of newspapers play out between my doubled-up legs as I hung upside down for a split second.

I might add here that it also gave me an entirely different feeling when the weight of my shoulders hit the resistance of the opened 'chute and literally whip-snapped me upright.

But again she opened nicely. She spread out high above me; her thirty-four feet of saucer-shaped cloth looking as big as a circus tent; her worn shroud lines running from the wooden steering wheel rim right above my head up to the edge and over the top and down again to the wheel.

There was one big patch right beside the vent hole, which her former owner told me was the result of a jump from a high bridge and I always liked to watch that patch for some reason or other.

But the patch never gave way, and thirty-three times I relegated my young and foolish neck to her dilapidated

(*Concluded on page 60*)

Another Training Stunt with Radio

The instructor radios instructions from the apron.

A STATEN ISLAND man, Charles Z. Alextuinas, has just built a new 3 pound short-wave transmitter-receiver, which works on 1/10 watt power, using a ¼ wave antenna.

The batteries, tubes, everything, are contained in the one unit. There are 2 units to the set, which provide 2 way voice and code communication, with a radius of 4-5 miles.

This radio was tried out here by one of the operators with a view towards utilizing the radio for flight instruction to which it adapted itself perfectly.

As the 2 photographs show, the instructor stands out on the apron, watches the student fly, take-off, land, etc., and inasmuch as the instructor can observe everything the pilot does, he can instantly communicate with the pilot and tell him how to level off, glide down, etc., etc., etc.

Owing to the extreme lightness and therefore portability of the set, it is easy to use for both pilot and instructor. Before the flight, the sets are set for wave-length, etc., and the instructor merely transmits what he wants to say. The student can also talk to the instructor. The set can be put in any plane; it needs no attaching, or shielding, such as is common with the usual aircraft radio.

It worked out very well, and there are indications that the owner of one of the flying schools here may buy several of these sets for such use, as he thinks that such a method of instruction would turn out well.

The student's headset.

The International League of Aviators

A PROJECT to form an air force of nations, to be under the auspices of the League of Nations for the purpose of enforcing the decisions of the Geneva body, was made public in Paris by the International League of Aviators, outstanding world flying organization, through its president, Clifford B. Harmon. He declared that the majority of members of the League sponsored the proposal as "the sole practical measure to enforce peace."

The International League of Aviators, founded in May, 1926, includes most of the outstanding world fliers of today. Its trophy has been given to Lindbergh, Coste, Eckener, Scott, Post, Balbo, Piccard, Musick, Lady Bailey, Amelia Earhart, Amy Johnson and others, and by such personalities as the late King Albert of the Belgians, the King of Spain, etc.

Details of the project include the contribution by each nation of a percentage of its well trained flying personnel and equipment with no expense to the League of Nations until the air force were called into action.

In this contingency, according to the proposal, the International Air Force would be financed by the League of Nations' Budget until the tension which had caused the emergency could be eliminated. The warring nations would then be required to reimburse to the League of Nations such expenses as their belligerency had caused.

If for any reason, the League of Nations could not be at the head of this organization, the big powers should nevertheless, create an International General Staff of the Air Forces outside of Switzerland which is a neutral ter-

(*Concluded on page 67*)

The Douglas Twin-Engined Boats

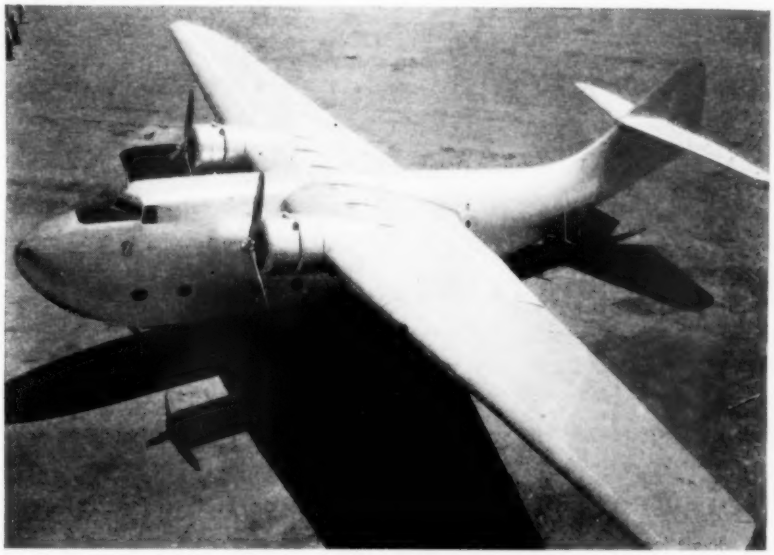
by MAX KARANT

Donald Douglas turns out a notable trans-oceanic type flying boat that has met with high praise from official sources. As with the Douglas DC-2, the boat shows an outstanding performance.

DONALD DOUGLAS, one of this country's top-notch designers and builders of airline equipment, made a definite bid for trans-oceanic equipment supremacy recently when the long-range twin-engined flying boat shown above made its first public appearance in the hands of Douglas test pilot Carl Cover.

Making its appearance with much less publicity than Martin's and Sikorsky's ocean-going airliners, the new Douglas boasts performance which should outdo the present Pan American trans-Pacific Clippers. Compared to the Martin and Sikorsky Clippers, the Douglas flying boat boasts equal performance with its two engines to the others' four engines. Douglas statistics give the new liner a capacity of 32 passengers and a cruising range of 3,300 miles at 164 miles an hour cruising speed.

Biggest difficulty with Pan American operations with Martin and Sikorsky Clippers today is these ships' lack of long cruising range with full loads. All present flights over Pan American's San Francisco-Honolulu route have been made with only about six passengers, although these ships are supposed to be capable of carrying 37 passengers. This lack of passengers is laid to the fact that the Martin's and Sikorsky's must carry that much additional gas to make the 2,400 mile hop to Hawaii.



Looking down upon the wing we note the protected arrangement of the cockpit and the exceedingly high freeboard of the Douglas boat. The fairing of the engine nacelles and hull into the wings is very neatly worked out.

The new Douglas trans-oceanic airliner has several novel features, among them retractable wing floats. Recently brought into popular use by Consolidated Aircraft Corp., whose retractable wingtip floats now are standard equipment on naval patrol boats built by that company, the floats on the Douglas fold into a streamlined wing compartment when not in use.

Douglas's new big boat weighs 28,500 pounds, only 2,500 pounds more than the Douglas DST. Despite its bulk, the all-metal flying boat is so built that it can withstand extremely rough seas. The tail sits high above the water and the wings are specially stiffened.

If test flights prove the ship to be all Douglas engineers claim for it the trans-oceanic flying boat market will definitely have three major manufacturers "after the business" instead of the established two of today

With trans-Pacific operations already established and trans-Atlantic negotiations now nearing completion, America's Pan American Airways and England's Imperial Airways are preparing their equipment for the launching of regular passenger service across both oceans. With scores of waiting reservations for trans-Pacific transportation to the Philippines, Pan American must ship the majority of its passengers by boat between California and Hawaii. The Pan American Clippers can carry a much larger load between Honolulu, Midway, Wake, Guam and Manila because each hop is comparatively short and gas requirements not so high.

Here we have a view of the retractable float and the porthole arrangement which, by the way, does not seem to afford the passengers particularly good visibility.

Here is an under wing view showing one of the floats retracted into the wing, a view that also shows the exceptionally deep step.

The New Science of Bailing Out

by
LIEUT. H. LATANE LEWIS, II

Official photographs by the U. S. Army Air Corps, Information Division.

Showing the method of folding and packing U. S. Army Air Corps parachutes. Scene at Randolph Field, Texas.

WITH the speed of airplanes constantly increasing, the question arises as to just what is the limit of speed that a man with a parachute can get clear of a falling plane.

At 200 miles per hour the pressure of the air is terrific and it is only with great difficulty that a pilot can force his way out of his cockpit.

Moreover, what about the parachute? How much strain can modern types withstand? And will a type constructed for fast openings be efficient for openings at low speed?

The Materiel Division of the Army Air Corps has been trying to find the answers to these problems during a series of recent tests at Wright Field, Ohio, and a new science of parachute jumping is being developed. Air Corps officers are fast coming to the opinion that a man could not force himself into a blast of air passing his cockpit at much over 200 miles per hour.

With our new pursuit planes diving at better than 400, a serious problem has arisen. Many are wondering if it will result in the development of some method of breaking the airstream about the cockpit in an emergency, or of catapulting the pilot out by mechanical means.

Just what an airman is up against when trying to force his way out of a rapidly falling ship was reported graphically by Captain Albert W. Stevens of the Army. Stevens had to bail out of the gondola of his stratosphere balloon in 1934 when the envelope burst and the gondola dropped like a plummet.

"Twice I tried to push myself through the door of the gondola," Stevens states, "but wind pressure of the fall forced me back. So I backed up and took a headlong dive at the opening and managed to hit it fairly, and went out headlong, parachute and all.

"By that time we had fallen 1,500 feet and were falling so fast that the wind pressure held me practically even with the gondola. In other words, I was not falling away from it, but floated opposite it." Before reaching the ground, however, Stevens was able to get clear and open his chute. His experience demonstrated dramatically the kind of struggles that can be expected in trying to make high speed jumps.

For this reason the Air Corps has been studying the possibilities of the pilot of an airplane throwing himself out by some violent manipulation of the controls. The cockpit of a pursuit plane is small and extremely difficult to get out of in a hurry. Pilots flying this type of aircraft have on numerous occasions hurled themselves clear by pushing the ship over suddenly into a half outside loop.

Another method that has been found useful is the snap roll. Of course, with these methods the pilot must have some degree of control over his ship in order to perform the prescribed maneuvers. In many cases, such as breakage of a wing or mal-functioning of the controls, the pilot would be helpless.

Several mechanical means have been tested, such as a trap door in the bottom of the cockpit or a folding door in the side of the fuselage, through which the pilot's seat is hurled by lever arms.

But none of these methods has been sufficiently promising to be adopted by the Army, and the problem is still being given considerable study.

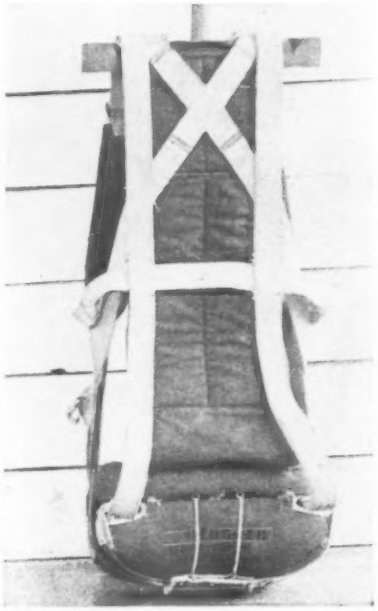
Now here is an interesting thing that Air Corps officers have determined about leaving an airplane at high speed. As soon as the pilot is clear of the ship he begins to slow down. In fact, he appears to be blown backward.

The reason for this, they have determined, is that the terminal velocity of a man falling freely through the air near sea level is surprisingly low. (Terminal velocity is the point at which the resistance of the air equals the force of gravity and no matter how far a given body falls, it will not travel any faster.) The figures vary from 90 to 120 miles per hour for a man weighing 180 pounds and carrying on his back a parachute pack.

Consequently when a man leaves an airplane when it is traveling at a speed in excess of his terminal velocity, as it usually is, he immediately decelerates. For this reason pilots are being advised to delay opening their chutes for a time after clearing their planes. This will cut down the terrific, soul-jarring jolt of a high speed opening.

And what about the parachute itself? How much of a beating will it take?

Wright Field engineers have been making hundreds of drops using dummy men. The drops have been made from both level flight and from



A parachute fitting rack, Parachute Department, Chanute Field.

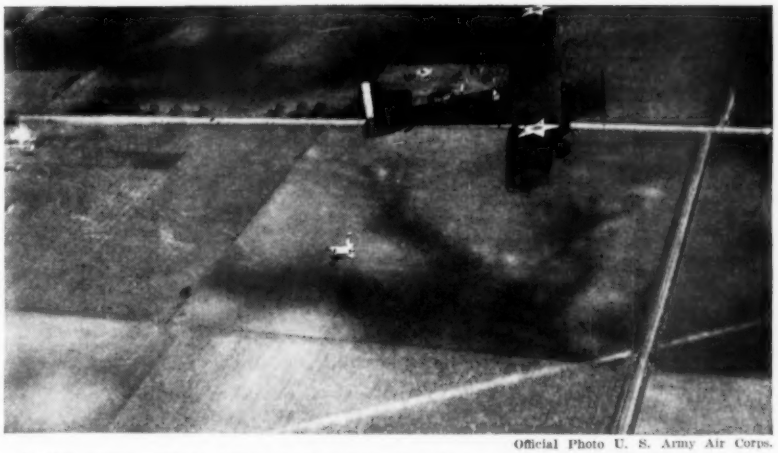
# of High-Speed Military Craft

dives of about 200 miles per hour and the shocks were measured by means of a dynamometer. The experiments have uncovered several interesting facts. A parachute dropped from an airplane in a steep dive is subjected to a much higher shock than is one dropped at exactly the same speed from an airplane in level flight. The reason for this is believed to be that when a parachute is dropped from an airplane in level flight, it falls in a somewhat curved trajectory, and as a consequence the lower side or edge of its mouth is blown inward somewhat during the opening stage.

This pressure of air from the outside is the principal reason for the reduction in shock loading when compared with the parachute which has been dropped more nearly vertical and has not had the cushioning effect of this air pressure from without. This is shown in one of the photographs.

It has been determined by dropping parachutes with compact lead weights that the ultimate breaking strength of both the Irving and the Triangle parachutes is of the order of 8,300 pounds. It is believed that this is a greater strain than would ever be placed upon a chute in active service. These drops are made by attaching a dummy weighing 1,000 pounds to a parachute and dropping it from an airplane in level flight traveling 100 miles per hour.

Vast improvements in the design of parachutes have recently been made. A few years ago, a triangle chute was developed with the air vent in one corner. This gave the chute a forward speed of about 5 miles per hour and gave the pilot greater control than was ever possible before.



Official Photo U. S. Army Air Corps.

A live jump. Photo taken just before the chute opened, at terminal velocity.

U. S. Army Air Corps Photo.

This shows that the pilot has a tight squeeze in getting out of a pursuit plane cockpit with a parachute.

Now, Major E. L. Hoffman, the Army's parachute expert, has designed a triangle chute with a sort of nose and tail which make it glide almost like a sailplane. The nose is in the form of an auxiliary piece, five feet across, taped on one side of the chute, while the tail is an extended vent through which the flow of air is directed.

One of the greatest problems in parachute operation has always been that of collapsing the chute after reaching the earth. Jumpers have frequently been badly dragged when landing in high winds, and the writer once saw a man dragged across a railroad track before an oncoming train.

Moreover, landings in the water are made extremely hazardous by the possibility of the jumper becoming entangled in his chute. Now an arrangement has been made whereby the pulling of a single release cord snaps the chute loose from the harness and releases the wearer. This is believed to be one of the greatest advances since the development of the parachute.

One of the most startling developments of all is the newly demonstrated "human bat wings" invented by Clem Sohn in Florida. The equipment may prove to be useful in controlling descent before the opening of a chute. It consists of a fabric webbing which extends between the arms and legs and has the effect of converting the wearer's body into a glider.

By moving his arms and legs he can control his movements through the air, performing loops and rolls and other stunts. Before reaching the ground, however, he yanks the rip cord of his chute and floats down under the silk.

The Navy has recently made improvements in the material from which its parachutes are being constructed. A high grade silk, with the most efficient weight-strength ratio yet obtained, has been developed. Parachute silk must have great tensile strength as well as resistance to tear. In addition, the porosity or rate of air flow through the fabric, must be held within specified limits. So effectively has the Navy worked out these problems that its latest designed chutes descend at the remarkably low speed of only 8 feet per second.

The Navy has developed a routine which is believed to assure that its chutes be of unquestionable quality. Out of every new lot that is made up, chutes are selected at random and tested to destruction to determine the strength of the assembly and the force required to produce a dangerous rupture. The destruction test consists of a series of drops from a height of 1,000 feet, increasing the load at each successive drop by increments of 50 pounds until excessive rupture of some part of the parachute occurs.

A free fall of 330 feet is allowed before the rip cord is pulled and the falling speed acquired during this distance subjects the parachute to a magnified shock load upon opening.

A parachute which functions under the standard drop test and is accepted after rigid inspection as fit for service can reasonably be expected to fulfill its purpose in an emergency.

Further routine recently adopted by the Navy for chutes in service is interesting.

All parachutes in service are unpacked at least once every month and carefully inspected. This periodic inspection is for the purpose of relieving the pressure on the packed silk to eliminate excessive creasing where folded, airing and drying the fabric to prevent mildew, disclosing

any defects or damage which may have occurred, and correcting all improper features which materially reduce the number of major repairs required.

Whenever doubt exists as to the fitness of a parachute, or when it is impossible to determine by inspection whether it is safe or not, the parachute is reported for drop test. This test is similar to that conducted for acceptance and indicates whether it is fit for further service. This test is also given after any repairs.

At the expiration of 5 years service, regardless of their apparent condition, parachutes are withdrawn from service, assembled at a central station, and drop tested. Those chutes which are in good condition are returned to active service for a period not to exceed one year, after which they are automatically withdrawn and surveyed as having completed their useful life.

The Services realize how much depends on their life belts of the air and are vigorously attacking the problems which are arising with the increase in airplane speeds. The Army maintains a special Parachute Branch at Wright Field which day after day devotes its attention to producing bigger and better parachutes.

One of the officers assigned to this work recently summed up the probable outcome of the question before the Branch today—that of designing the best all-purpose chute.

"Of course," he states, "it is not readily foreseen how one can have a parachute which will automatically open promptly at low speeds and yet successfully withstand the shock resulting from such rapid opening when subjected to high speeds. These two conditions appear contradictory and therefore a compromise seems the only solution."

That such a development will be made is simply a matter of time—if Army parachute men continue to experiment with and work out this particular problem. But such an advance is a long, tedious task. Air Corps parachute experts have been working on a huge airplane-lowering 'chute for many years and still have not found a successful means of lowering a disabled aircraft.

U. S. Army Air Corps Photo.

A Triangle chute with the nose and tail attached.

Here Is the First Stainless Steel Airliner

The side elevation of the stainless steel Fleetwings Sea Bird, showing how steel can be very successfully substituted for aluminum alloys.

THE first stainless steel plane built for commercial purposes was demonstrated at Bristol, Pa., by Fleetwings, Inc., and christened the Fleetwings Sea Bird by Mrs. Carl de Ganahl, of Bristol.

The plane, a four-passenger cabin amphibian designed for the use of sportsmen and incorporating a number of new features, was described by Edward G. Budd, of Philadelphia, principal speaker at the christening ceremonies, as the counterpart in airplane construction of the stainless steel, light-weight, high-speed trains built by the Edward G. Budd Manufacturing Company.

Like the light-weight trains, it was constructed by the "shotweld" process of fabricating stainless steel which Fleetwings has employed for several years in the production of airplane parts.

Through the use of this metal and process, the fuselage and wing are virtually a one-piece unit. At the same time, the method of construction has made possible an amphibian plane that, its builders say, is lighter in weight than any other plane of comparable size and that is more fully streamlined than any other water plane.

The Sea Bird, including the most modern improvements and instruments, weighs but 2,285 pounds empty, which, it was pointed out, is from 100 to 200 pounds lighter than even a land plane of conventional construction and comparable capacity. With four passengers, 52 gallons of gasoline in two seam-welded stainless steel tanks in the wing surfaces, 5 gallons of lubricating oil, and 100 pounds of baggage in a large luggage space back of the seats, the gross weight is 3,415 pounds.

In test flights the plane, powered by a 285 HP Jacobs radial air-cooled engine with direct electric starting, mounted above the cabin, attained a speed of 150 m.p.h. and cruised at 135 m.p.h. The power loading is 120 lbs. per HP, small enough to produce the remarkably fine take-off on either land or water which the Sea Bird has shown in test flight. The plane climbs at the rate of 900 ft. per minute and has a practical service ceiling of 15,000 ft.

It is equipped with modern flaps and drooping ailerons, which reduce the landing speed to 47 m.p.h. With brakes this low landing speed makes it easy for the sportsman-owner to fly into small airports or fields with safety. The plane has a cruising range of 450 miles.

Performance of the ship, according to Carl de Ganahl, president of Fleetwings, is due in large measure to its unusual streamlining. Even the hydraulically operated retractable landing gear contributes to the flying qualities for when the wheels are raised, all struts disappear completely into recesses in the hull.

Only the two wheels remain as partial protrusions and even these are smoothly covered by fairing so that they become, in the horizontal positions, actually small lifting surfaces. The result is that air resistance (drag) is reduced to a very low figure, since it is such a remarkably clean ship.

Still further curtailment of drag has been obtained by careful design to keep all fittings within the structure; but the outstanding drag reduction has been accomplished by the nature of the "shotweld" stainless steel structural method. The glistening stainless steel sheet which covers the hull is attached to the stainless steel frames entirely by the "shotweld" process.

These welds, as strong as the metal itself, leave no protrusions or depressions such as are caused by protruding rivet heads used in most metal planes. The skin of the hull is therefore exceptionally smooth, without any protruding rivet heads. Aircraft engineers know what an amazing improvement this flat surface is over the excessive drag caused by rivet heads.

The plane also has unusual handling qualities in the water. The flying wires and the landing gear fittings are all above the water line so that there is no water interference during take-off. The smooth, rivetless, stainless steel hull it-

(*Concluded on page 69*)

"....Clear and Unlimited"

Our versatile commentator, in his highly interesting and entertaining manner, makes pertinent remarks concerning doers and doings in aviation.

by SWANEE TAYLOR

Preview Congrats . . .

Unless my Washington spies are awfully wrong, and unless somebody else has in the meantime tapped a private source, this will be the first journalistic Trumpet Blast heralding the ascendency of Colonel J. Carroll Cone to the driver's seat in the Bureau of Air Commerce. On the 15th of November he is due to take-over, very quietly of course, as "Acting" director. Then, after a decent mourning interval, he will—Praise be!—be dubbed, Sir Carroll, the Duke of Aeronautics.

Carroll Cone is, save evidently within the ken of backward *politicos*, far too well known for a lengthy recital here of his personal abilities. He has plenty on the ball, aeronautically speaking, and he pitches a very clean game indeed. Which makes us all glad that he's at last in, and we can feel reassured for the first time in three long years.

Personally, I marvel at the man's tenacity and his cool fighting talent. He took all they had to offer and licked 'em hands down. But isn't life a trifle too short for bothering to take the cruel ambuscade of poisoned political slings and arrows such as he took?

Swanee Taylor, the author, who discusses various and sundry occurrences in aviation.

Pop-gun Cannonade . . .

Speaking of the great game of politics; even as this is written, the thunderous hush of soggy fire-crackers thrown at the President is heard throughout the land—by all blessed with hyper-acute ears.

A monstrous objection is being voiced against Elliott Roosevelt having tried one time early in the dynasty to tie-up with aeronautics. You know, sort of like Herbert Hoover, Jr., moved in as a radio editor, and a ditto expert, to the mutual satisfaction of all concerned. But, of course, Elliott didn't join that little trade-houseorgan as their botany editor so he's wide open for any and all wallops as long as they land above the knees.

It seems that young Roosevelt's crime against the human race is wrapped in his dastardly hope to sell some "military" airplanes (whoever heard of Lockheed doing anything with military types!), to the Soviet government. At the time business in general was terrifically enthused about gathering in a lot of gold rubles. Some of our "military" motors were sold over there at a wholesome profit to the makers. But the Russky's decided all of a sudden to pay-off in jelly-beans and the Roosevelt-Fokker-Lockheed bubble burst like an amorous old maid's awakening.

All in all it was sort of silly to drag that one out of the grave, either as a political expedient or as a circulation plug for dear old *Aero Digest*. For, it failed miserably in both directions. Already in less than a week the story has been shoved way in the back of the papers with the goitre cures and orthopedic bandages where it loses every atom of political force.

From a circulation-getter angle the device doubtless will prove a distressing boomerang. The reading public has a keen sense of fitness and decency, and is overwhelmingly resentful of foul tactics. Striking at a man through his son's mistakes, real or fancied, is promptly placed at zero level of sportsmanship. Right alongside a group of veddy, veddy social ladies(?), over in Montclair, New Jersey, who, whilst twirling their pearls, organized *claques* to hiss the President at the neighborhood movie theatres.

In Reply . . .

"In the September issue of POPULAR AVIATION, at the end of your article was a portion named, 'If I Were an Airplane Pilot.' From what followed it is apparent that the word 'Air Line' instead of 'Airplane' should have been used. I have tried to keep from writing this letter for over a week, but there are several things mentioned in the paragraphs upon which you have the wrong slant and I am compelled to call them to your attention.

"In paragraphs 2, 5, and 6 I perfectly agree with you. But in paragraphs 1, 3, and 4 it is apparent that you do not know whereof you speak. Let's examine them.

"Paragraph No. 1 deals with mingling with the passengers. Now that *was* a good idea, but it was stopped some time ago by D. of C. regulation that we stay in the cockpit and *keep the door locked!*"

[Check on No. 1. But you do agree it was a good idea. Wonder who GOT the department to put that one in?—S. T.]

"Paragraph No. 3 states that all landings under normal conditions would be glide landings. To which I reply, 'Oh, Yeah?' Here it is apparent that you simply do not know what you are talking about. In the old days we always made glide landings. It improved our accuracy which was needed 'just in case.' When Fords were used on airlines glide landings still prevailed. Now a great majority of the Air Line Pilots flying today were also flying those Fords and were making glide landings. Did you ever stop to think why they should stop this practice? The answer is that it simply can't be done with consistency and safety—not with modern transports. Different ships with different loads so change the glide and landing characteristics that it is impossible for one to understand, without day-by-day experience, just how different each approach and landing is. Then the flaps change the whole picture. . . . I am flying a 247D which does not have flaps, and under certain load conditions can make beautiful glide landings. However, to try to do that consistently would necessitate slight forward slips occasionally. And these slips, even though slight, frighten most passengers. Consequently we use slight pull-in approaches."

[Okay, I get it. However, I don't agree with the swivel-chair pilot in the front office who says that passengers are frightened when you slip a little. I know better; I've slipped too many. Besides, the airlines riders today are pretty much regular customers and are mighty darn airwise. I still say that if the boards of directors will leave operations alone we will have close to 100% performance.]

"Now paragraph No. 4. Approaches to a terminal at times must be made at a rather low altitude over populated sections. Schedules are so set up that it is impossible to waste time. But we shall disregard that point. Traffic around the terminals is so great that it is prohibitive for transports to circle around the field for 10 minutes after arrival. . . . Suppose we hold 2 to 3 thousand feet until the airport is reached. Three to four hundred feet per minute rate of descent is the max-

XUM

imum allowed. This is due to the fact that experience has shown that passengers' ears just can't stand a more rapid descent. Can you imagine the traffic tie-up resulting from planes arriving at 3000 ft., descending 300 ft. per min., circling 'round the port for 10 min.? Collision hazard out on the airways is already great enough without adding more to it at the terminal.

"When planes arrive they must be in position to land as soon as possible. We don't like to fly low over populated sections any more than you do, but it has to be, for it is the safer of two evils."

[Again, or still, I'm wide-out on your side. And I know and appreciate what you're up against—traffic jams, control-tower laziness, thoughtless saps staggering around through the breeze, etc., etc. God knows what you're going to do when the influx of ward-heelers into the control towers really starts. They'll cause lots of deaths.

Yet, I've got to jabber with you on two points. First, about the passengers' ears. Isn't that due to still another hostess failure? Or don't they know either? Many times I've told fellow-passengers how to equalize the internal and external pressure in the head, while all I ever heard a hostess say, and only one of 'em at that, was to swallow. What do you think?

Second point: Eliminating the rate of descent point for the moment, wouldn't it be a happy solution to have all aircraft arrive at a 1,000 ft. "stage" a mile and a half from the edge of the field? Then circle on down, keeping within gliding distance of the field. I'm talking about clear weather, of course. It appears to me that the control tower, or a sub-control, is going to have to move away from the comfortable precincts of the operations office. Just like an outlying switch-tower sends trains into the railroad yards. Please let me have your opinion on this.]

"'If I Were an Air Line Pilot'—well, it is obvious from what followed that you are not! Let's write only of those things about which we know. Now I have that off my chest!

Sincerely,

AN AIRLINE PILOT.

"P. S.: You write lots of things that I heartily agree with; i.e., about the map elevations."

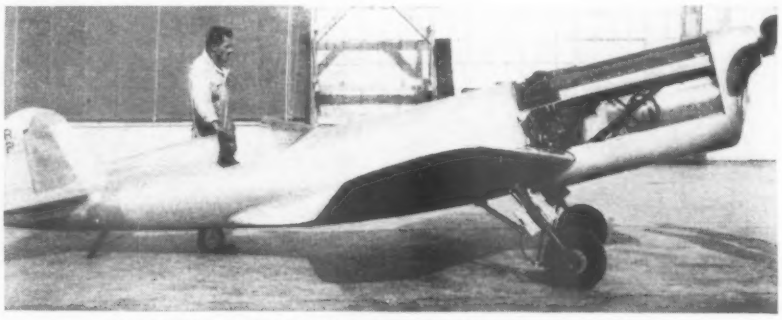
[Thanx for the letter; I appreciate it with all my heart. You have opened the way to constructive discussion, which, every reader will heartily agree, makes for better aviation. I'd like to use your name, but I'm afraid that long-nose buzzard in your company will put you under hack. Sing out if I'm wrong, or sing out if I can help.]

Family Feud (Concl'd) . . .

For once and all, I hope: I'm not against the Hammond Plane. Nor am I against anything with wings and flippers. But I am unalterably opposed to anything that is used by self-seekers to ride to the high places. *Finis!*

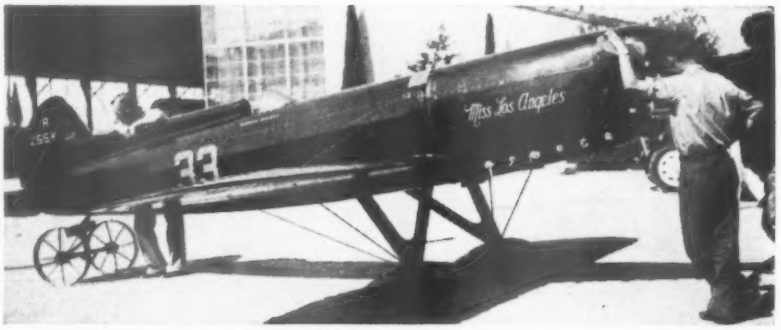
More Shots of the National Racers

Photos by Robert C. Morrison

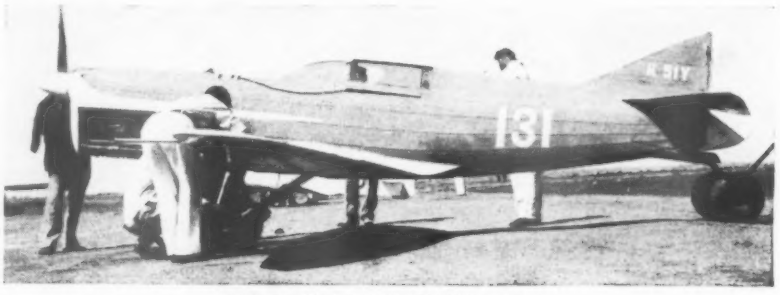


The Crosby all-metal racer showing the engine installation.

Rae's Keith-Rider racing plane revving up for the take-off in a race.



"Miss Los Angeles," well known to all race fans, equipped with a Menasco engine.



Kling's ill-fated Keith-Rider racer.

The NATIONAL AIR BOARD Says— *Unbiased Opinion to Further National Aeronautics*

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ALEXANDER KLEMIN, CHAIRMAN

THE Fifth Meeting of the Air Board registered the maximum attendance since its inception. The attendance and the animated discussions indicated that the interest of the members is greater than ever.

HOW SHOULD THE SERVICES FOSTER NEW IDEAS?

E. Burke Wilford, in a thoughtful written statement, brought up a problem which is of truly national importance, the utilization of new ideas by the Army and Navy Air Services. From the engineers of progressive companies, from individuals of inventive and original mind, from workers at the Universities and the N.A.C.A., there is a continual stream of new ideas, some of which are of the highest importance to the performance and safety of aircraft.

Even when such ideas are fundamental and have been fully vindicated by laboratory work it may take from 5 to 10 years before they are applied in service designs. It is true that the services have the right to buy a meritorious patent for a sum not exceeding $75,000 but they have exercised this privilege in only one important instance, the Handley Page slot—a foreign development.

When the proponent of an original idea does receive a development contract from the government, he generally has to give a non-exclusive license to the government and to take the entire risk of development with payment contingent on complete success. But the greatest hardship experienced by experimental engineers and real inventors lies in their inability to secure attention.

Wherein is the cause of such inattention? In the fact that the officers charged with new designs are capable hardworking men but harassed beyond measure. Under pressure of the tactical and operating personnel, the "new design" officers are forced to concentrate attention on routine improvements, on minor refinements, on getting 10 miles an hour more speed, to the neglect of fundamental advances.

Another bar to progress lies in the fact that while both the Army and Navy now have ample funds for experimental construction, at least a couple of million dollars apiece, only an insignificant fraction of such funds is available for real development work.

Mr. Wilford further pointed out, forcefully and cogently, that there was no lack of vital problems awaiting solutions. It is an open secret that two-thirds of the time our seaplanes cannot operate because the water is too rough for them and take-off is impossible; that Army planes cannot operate in wooded or mountainous territory—two striking examples of such problems.

The Board debated methods of improving the situation long and carefully and arrived at the following definite recommendations:

1. That in each of the services, Army and Navy, a Development Officer be specially designated to encourage the utilization of new ideas, as distinct from routine improvements.

2. That of the annual funds allotted for experimental construction, at least 20 and if possible 50 percent should be specifically ear-marked for fundamental work.

Incidentally it should be pointed out that every Government except our own adopts a policy such as outlined above.

FOREIGN PARTICIPATION IN OUR AIR RACES

We all know that the great success of Detroyat at the Los Angeles Races gave rise to much disappointment among the American contestants. Therefore Casey Jones' question whether the races should be open to all competitors or be confined to American pilots was very timely.

There is a line of argument in favor of restricting entrants to home talent. Here was a foreign pilot with a ship frankly developed with the support of the French government. To develop this ship therefore there were available unlimited funds.

Our racing groups are mainly small associations of skilled constructors and

This is the Luton "Buzzard" lightplane that represents advanced British practice. It is priced at $1,600, but has such modern refinements as split trailing-edge wingflaps and a cantilever landing-gear. The fuselage is a wood monocoque construction of oval section. It is powered by a 34 h.p. inverted vee engine.

experienced pilots working under "back-yard" conditions, risking their own money and relying mainly on prize money to keep going. Certainly it seems a hardship for such courageous, skilled small groups to struggle against the governments of the world!

But there is definitely another side to the argument. "Air Racing should draw the best from everywhere," said Mr. Post. "Should we not attempt to learn something from the world at large rather than to be content to stew in our own juice?"

Randolph F. Hall pointed out that in the days of the Pulitzer Trophy, competing manufacturers entered ships sponsored by the government which led to marvelous advances in design. In general, almost all the members of the Board agreed that the greatest value of the national races was to foster as fierce a competition as possible for the greater advancement of aviation.

Tossing the question to and fro in a friendly but animated manner, the Board finally arrived at a decision which seems to have much to commend it.

1. National races such as the Thompson Trophy or the Bendix Transcontinental, should be open to one and all.

2. Minor events in the national air races and all events in local races should be restricted to American participants and moreover to non-governmental American participants.

Such a policy would be calculated both to foster ideas and to give the "back-yard" workers the maximum opportunity of breaking even in their now somewhat speculative endeavors.

Here is the Vincent Bendix Trophy, the objective of hotly contended races and the ultimate in the racing pilot's life. It is even more important in this day and age than was the old time Gordon Bennett Trophy of 1910.

IS THE AIR PILOTS' ASSOCIATION TOO EXCLUSIVE?

From foreign participation in the air races, the Board turned very naturally to a discussion of the Association of Racing Pilots. There does seem to be a tendency for this association to form a close cooperation.

The association was originally formed to diminish the risks involved in high speed races, a laudable objective. In practice, however, the rules of the association might lead to the exclusion from races of experienced and highly desirable participants.

For example, Ruth Barron was ruled out of one meet and certainly women with her skill and experience should be welcome. Miss Barron offered to join prior to the race, but the rules of the association bar women from membership.

FEEDING BIRDS FROM THE AIR

It is the great strength of the Air Board that its members between them cover every aspect of aviation. Thus, thanks to August Post, the Air Board was able to take cognizance of a national movement for the conservation of bird life by dropping food from the sky.

One plane with 500 pounds of selected grain packed in 1 pound bags was recently able to cover the vast and inaccessible areas of northern New Jersey within four hours, bringing much needed succor to wild birds throughout the state. Attempting to feed the birds by any other method would have taken two weeks of hardships.

The method employed is very simple. A thumb hole is punched in the 1 pound paper bag before it is dropped. The bag bursts before hitting the ground and the grain is released in a 25 foot circle. It is also on record that Commissioner Harry M. Armstrong of the New Jersey Game and Fishery Department saved the lives of thousands of ducks in the lower bays of New Jersey and New York by spreading grain from the sky at a time when ice prevented boats from reaching these areas.

WARFARE BY PARACHUTE

It was as far back as 1920 that Colonel Rickenbacker, speaking at a meeting in California, suggested that tanks might be carried aloft by airplanes and be released behind enemy's lines, so introducing elements of surprise and breaking up the hateful trench warfare.

Now in 1936 a striking example of surprise value in warfare is given by the recent Red Army maneuvers. In the last phase of these maneuvers a force of 1,200 men with 150 machine guns and 18 light field guns was carried 100 miles by aircraft and dropped on an air field behind the "enemy's" ground. Within 8 minutes of their release the parachute force had assembled on the ground and driven off the defenders.

This parachute warfare is so spectacular that its potentialities may on that very score be minimized. Yet it is a well-known fact that all armies and their commanders are acutely susceptible to the threat of a blow in the back and of the interruption of their communication lines.

The Air Board felt that the possibilities of parachute warfare were important, yet that it would be presumptuous to imagine that our own Army Air Corps was ignorant of such possibilities. Captain Brooks thought that our own authorities were probably well ahead of the Soviet tactics.

Nevertheless, the Board felt on safe ground in instructing the Chairman to write to the Chief of the Air Corps drawing attention to the Russian development and inquiring whether any such similar American tactical experiments might be released for publication.

SHOULD GLIDER PLANS BE DISTRIBUTED BY THE GOVERNMENT?

Earl R. Southee, one of the main figures of the Soaring Association of America, sent in an interesting clipping which shows that American glider constructors are not leaving the field entirely to foreign builders. Thus Harry Bowlus who taught the Lindberghs to glide, is completing the first all-metal sailplane ever built. In a 300 pound motorless craft he expects to soar from San Francisco to Los Angeles non-stop. The minimum distance with tacking would be 415 to 420 miles. This would be some 100 miles more than the world glider distance record held by Germans. The American record is 158 miles.

Mr. Bowlus will ride as the navigator, accompanied by a pilot to be named later. It may seem peculiar that a navigator should be required on a glider flight, but considering what skill is required in utilizing thermal and other favorable currents, the notion of a special navigator is not so odd, after all. Many new ideas in design and equipment will be incorporated in the new craft which will be 25 feet long and have the enormous spread of 60 feet.

In commenting on this welcome news, Mr. Southee pointed out that the builders of powered aircraft had the chance of winning large purses in the national air races, while the glider builders and designers had to make real sacrifices for the sake of advancing the science and art of motorless flight. Should not some federal agency, Mr. Southee asked, help out the hundreds of men and women throughout the country interested in gliding by issuing approved plans of gliders?

To this suggestion the rejoinder of the Air Board was clear and definite. Certainly the glider art should be en-

(*Concluded on page 66*)

T. W. A.'s Over-Weather Surveys

An experimental laboratory plane is to be employed by the T.W.A. airline for investigating weather conditions at high altitudes. This special plane is expected to disclose much valuable information for the operation of airlines.

RESEARCH to be applied to a fleet of the greatest transport airplanes the world ever has known is to be started by Transcontinental & Western Air, Inc., operating scheduled service between New York and the Pacific coast.

This quest for greater knowledge to be utilized in connection with its aircraft of the near future is to be sought through TWA's new experimental overweather laboratory plane. As applied by the airline company, the term "Overweather" means exactly what the word implies—flight at those altitudes which are above the reach of storms and where turbulence is a factor unknown.

This new air-going proving ground of TWA will be flown at altitudes far above the earth, directing its research work primarily toward the goal of maintaining constant, sealevel efficiency of engines at altitudes near the stratosphere. With this end in view, special devices have been applied to the experimental overweather laboratory plane of the air transport concern, which, operating as a super-supercharger, will serve to accomplish the desired end.

TWA, through its president, Jack Frye, explains that high altitude flight for air transport undoubtedly offers the greatest potentialities for maintaining schedules; for smooth flight and for all desirable factors of travel through the air. These have been disclosed repeatedly by those individuals who have ascended into the stratosphere in balloons and by the many recordings of weather instruments sent to great heights on smaller balloons.

In his plans, Mr. Frye has disclosed that great aircraft of 50-passenger capacity, and with wingspreads of 150 feet, will be in service over TWA's coast to coast route within two years. But even before that will come another fleet of super-planes, exceeding in appointment power and speed anything in use today on the air transport routes of the world.

The Northrop Gamma plane used by T.W.A. for high altitude research work. It is provided with many special instruments and other devices which will make accurate determination practicable.

D. W. Tomlinson, a captain of T.W.A. shown ready for a flight.

Another view of the T.W.A. Laboratory.

Pilot in the open cockpit.

It is for such fleets of magnificent aircraft that research work of TWA's new experimental overweather laboratory is intended. Primarily, as has been said, the work of the laboratory plane is directed toward engine research. Supercharging equipment will be tested under all conditions; fuel consumption must be determined; speed differentials must be known. These and many other factors of high altitude flight are to be worked out and recorded through the work of the laboratory plane and those aboard it.

The tests flights are to be flown by D. W. Tomlinson, assistant to Paul E. Richter, vice-president of TWA in charge of operations. In the observer's compartment will be James Heistand, development engineer for the air line company.

It was Mr. Tomlinson who, as pilot of TWA's former laboratory plane, established therein a record which still stands for transport plane crossing of the United States, a flight which he made in 11 hours and 5 minutes. Many national and international records were established subsequently by the same pilot and plane in categories of speed, weight and distance.

TWA's new experimental overweather laboratory is a Northrop monoplane of the type designated "Gamma." It is the same machine, which, when being used by Mr. Frye as his personal plane, established a new speed record for the Chicago-Washington journey. It also is the same all metal monoplane in which Mr. Frye established a record for crossing the United States at the time of the return of air mail contracts

to private concerns following the cancellation of February, 1934.

As arranged for its new purposes, a special set of instruments has been installed in the observer's compartment. In order that their readings may be recorded permanently, a photograph of the entire panel is taken as the machine ascends to each additional 1,000 feet of altitude. A camera, suspended at the rear of the compartment on a fixed mounting, performs the photographic act as special lights are turned on by the observer to illuminate the instruments for the pictures.

The observer's instruments—thirty-six in all—tell the story of the engine's functionings. No part of that story is left untold and every chapter of it, not only is jotted down by Heistand but is recorded photographically for subsequent comparisons and study.

In several flights already made for the purpose of testing the equipment aboard the plane, altitudes of 35,000 feet easily have been reached by Tomlinson and Heistand. Obviously, oxygen for pilot and observer are essential to the welfare of both and so, for that matter, is heat. On one of the test trips to the 35,000-foot mark, the plane's thermometer reading was at the scale's lowest mark —30 degrees below zero, Fahrenheit. On the ground at the moment the temperature was in the immediate vicinity of 100 degrees above zero.

Heat is provided through a special heater operating from the exhaust of the plane's engine. Although both pilot and observer wear light summer clothing, each is comfortable because of the adequate heat supply.

When reaching altitudes at which the cold begins to be noticed, the laboratory plane's only opening (over the pilot's cockpit) is closed by the simple expedient of drawing forward the glass and metal cover which otherwise is pushed back over the fuselage immediately behind the pilot. The hatch over the observer's compartment is closed at time of take-off.

The oxygen used by Tomlinson and Heistand also is heated before it is taken into their lungs. The degree to which this heating occurs may be regulated separately by pilot and observer in order that each may suit his individual ideas in the matter.

Throughout each flight, the plane is in touch by radio with one or more of TWA's ground stations with which its route is lined. In order that Tomlinson may have both hands free to manipulate the many controlling devices in his compartment, a special microphone frame has been devised which also holds the oxygen tube in one corner of his mouth. Thus he is able to inhale oxygen or talk by radio to the ground without the necessity of using his hands to hold tube or microphone.

TWA, through its new aircraft and its contemplated new levels of scheduled flight, expects to revolutionize completely the present conceptions of air travel.

END

Much Attention Paid to Radio at Spartan

View of radio equipment used at the Spartan School of Aeronautics.

COMPLETE lecture and shop training in Radio is now part of every regular course at Spartan School of Aeronautics, Home of the Dawn Patrol, and advanced flight students apply their classroom knowledge to actual flight conditions in radio-equipped trainers.

The 900 watt telephone transmitter, and the 135 watt telephone and code transmitter were built by Spartan students in their practical classes, and their operation is carried on by qualified students.

By a special instrument, the exclusive development of Spartan School Radio laboratories, a ground course is given in flying the Radio Range Beacon system and in solving navigation problems by radio.

With its laboratory facilities and radio-equipped planes, used in conjunction with local airport and airway aids, Spartan School is equipped to give the required training for the new Department of Commerce non-scheduled instrument rating.

Planes Deteriorate in Tropics

THE effect of tropical climate on wings and other parts of planes has been exhaustively studied by officials of The K. L. M., which operates a 9,000-mile line to the Indies.

Fungus growth inside the wing has been eliminated by proper ventilation, and deterioration of the wings, whose transparent varnish appeared unable to withstand the violent radiation of the sun, was halted by application of aluminum paint.

Plywood of the wings of older machines was found to be affected in several spots, so an extra protection was applied, consisting of strips of thin gauze, stuck onto the wing with the aid of paint.

An airline operating in a very damp region, pointing out that engines "perspire," has advised its personnel to wrap the magneto wires and other electrical equipment with newspapers to absorb moisture when the ships are left out overnight.

The exhaust manifold is plugged with paper to prevent condensation of water in the manifold, and, of course, the engine cover is put on for additional protection.

New Australian Postal Regulations

AUSTRALIA is the first country in the world to approve postoffice proposals for the use of airplanes to fly mails at ordinary letter rates.

The capitals of the different states of this Commonwealth are separated by great distances, and this move will be the greatest help that interstate communications have ever received.

Thus, it will be possible for a letter posted late in the day in Brisbane, Queensland, to be delivered first thing next morning at Melbourne, Victoria, 850 miles away, or Adelaide, South Australia, 1,000 miles away. This will be possible because the government has adopted the principle of night flying by high-powered machines capable of 200 miles an hour in all weathers.

The service is to apply only between the state capitals at first. More than 60 new airdromes and emergency landing fields will have to be built all over the country, and the work of establishing them will be a special unemployment-relief measure.

While the principle objective is to speed up mail service in the Commonwealth at no increase in rates, the government also sees the aerial network as an important link in military defense.

Recent Stearman Training Planes

The latest type of training plane designed and built by the Stearman Aircraft Company for the U. S. Navy and the U. S. Army Air Corps.

WITH its training planes accepted and in use by four different military services, the Stearman Aircraft Company is now recognized as one of the foremost producers of ships of this type Consisting of three different models basically the same, but differing in motor and other small details, the present series of Stearman trainers are all of the two-place, open, strut and wire braced biplane type.

Largest purchasers have been the two military services of the United States. The first model constructed was given the designation 73 by the factory and was submitted to the Navy Department for testing. Subsequent with the passing of these Naval tests, an order for 61 of these trainers was awarded to Stearman. Designated officially as the NS-1, they became the first planes in Naval aviation to bear the Stearman trademark and were powered by 220 HP. Wright Whirlwind R-790-8 engines.

Overall span is 32′-2″ and the length is 25′-1″. With a gross weight of 2,700 pounds, the NS-1 cruises at 105 MPH., lands at 51 MPH., and is capable of a top speed of 123 MPH. Empty weight is 2,007 pounds and the cruising range is 320 miles, with an endurance of slightly over 3 hours. The NS-1 climbs 820 feet the first minute from sea level and can reach a 13,500 foot ceiling. Conventional construction is used throughout and all three models to be noted here are constructed like the NS-1.

The fuselage is of welded steel tubing, with a detachable engine mount. Fairing is of drawn aluminum alloy and covering is of fabric. However, forward of the leading edge of the lower wing, sheet metal is used to prevent the possibility of fire in case of backfiring from the engine. The seats are arranged in tandem and are of the adjustable type which accommodate parachutes. Directly to the rear of the second seat there is a baggage compartment in the turtledeck; dual controls and two complete instrument boards are provided.

The Stearman PT-13 training plane built for the U. S. Army Air Corps. This is also known as the Stearman Type 75.

The wings are of wooden construction, consisting mainly of solid spruce spars and truss type spruce ribs. The compression members are of aluminum alloy, and a sheet aluminum leading edge is also used. The ailerons are different from the main surface of the wing in that they use a framework of aluminum alloy. All covering is of fabric, and struts which connect the wing panels are of streamlined chrome-molybdenum steel tubing; standard drag wires further brace the wings. All fittings are of aluminum alloy with steel bushings, and the ailerons operate on ball-bearing hinges.

The empennage has an aluminum alloy framework and a leading edge of sheet aluminum. This is fabric covered, with the exception of a metal trimming tab on the left elevator, and wire-braced. The landing gear is full-cantilever and uses a torque-resisting, oleo shock-absorbing unit. This is faired with metal and the tires are of the high-pressure type. A full-swiveling, steerable tail wheel completes the landing gear. These NS-1 trainers are being stationed at the Naval Air Station, Corry Field, Pensacola, Florida, where they are supplementing and replacing the former primary training equipment.

Three of the model 73 trainer have also been delivered to the Philippine Army Air Corps. These differ from the NS-1 in that they are powered by Lycoming R-680-5 engines of 225 HP.; they are also used for primary training purposes.

Second model produced by Stearman was the 75, powered with a 225 HP. Lycoming engine. It succeeded in getting the primary training contract from the Army Air Corps and 26 were produced. These were so successful and performed so nicely that an additional order for 50 more of these planes was awarded, at a total cost of $329,659. This puts the price of each plane at $6,593 and this is for the plane itself, exclusive of engine, propeller, instruments, wheels, tires, and tubes.

Span of the PT-13, which is the official Army designation of the Stearman 75, is the same as that of the NS-1, but its fuselage is one inch shorter. It is

A Stearman 76D-1 as constructed for the Argentine navy.

lighter than the NS-1, weighing 2,616 pounds, but carries a greater useful load, as its empty weight is only 1,907 pounds.

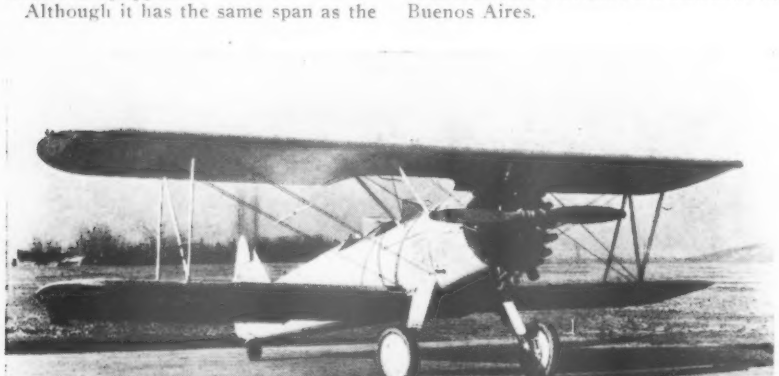
The PT-13 has streamline tires and wheels, and this little extra streamlining, together with its few added horsepower and lighter gross weight, give it a top speed of 125 MPH. at sea level. It cruises at 103 MPH. and lands at only 46 MPH. Eighteen minutes are required to climb to 10,000 feet and the service ceiling is 14,000 feet. Cruising range is more than that of the NS-1. The PT-13 has four hours endurance and in that time can cruise 412 miles. The PT-13's are used as primary training equipment at Randolph Field, San Antonio, Texas.

The third model is the 76D1 and this was produced for the Argentine Navy, to whom several have been delivered. It is used either as an advanced trainer or general purpose plane and can be flown with the standard landing gear or with twin floats, with which some of them are equipped.

Although it has the same span as the NS-1 and the PT-13, it is only 24'-1" long to compensate for the extra weight of the motor, as it is powered by a 420 HP. Pratt and Whitney Wasp Junior TB engine. This is enclosed in a full cowling. The plane is armed with three machine guns, having one in each lower wing panel which fires outside the propeller arc.

A telescopic sight is provided for these in front of the pilot's cockpit. The gunner has a machine gun to the rear of his cockpit which can be fired in any direction. A bomb rack under the fuselage carries several small bombs. Including the bomb load the 76D1 weighs 3,441 pounds; its empty weight is 2,251 pounds.

With this load it has a top speed of 167 MPH. and a cruising rate of 149 MPH. Cruising range is 395 miles and landing speed is 56 MPH. Climb to 1,400 feet is attained in the first minute after takeoff from sea level and the service ceiling is 20,000 feet. These Stearman 76D1 trainers are stationed at Buenos Aires.



Official photo U. S. Navy

The Stearman NS-1 built for the U. S. Naval air service.

The Japanese Airmail Organization

THE scheduled speed-up of Tokyo-Dairen line of The Japan Airtransport Co., Ltd., which runs the main airway of Japan, was put into effect at the end of 1935.

In this speed-up, the hitherto used Fokker Super Universal Monoplane (Bristol Jupitor engine) will be replaced by a new and more powerful machine. Already the Airspeed Envoy (2 Lynx engines) monoplanes are running on Urusan-Dairen line. Flight on Sundays will also be started early this year.

It is understood that the Airspeed Envoy monoplane will be constructed with home materials by Mitsubishi Aircraft Works modified to meet the requirements of our air-lines. The Japan Airtransport Company, Ltd., is now testing the first of these machines recently constructed.

The test runs to Formosa from Japan proper have been made several times. Beginning with the flight on October 8th, 1935, however, the regular flight once a week was started with mails and freights only. On and after January 2nd, 1936, the flight to the Island was made 3 times weekly with mails, freights and passengers.

On this line the Fokker VIIb Monoplane (3 Wright Whirlwind engines) was in use, but after this year will be replaced by Douglas DC2 Monoplane (2 Wright Cyclone engines). Nakajima Aircraft Works are now building 4 machines of this type with home materials to be supplied to The Japan Airtransport Co., Ltd.

The Japan Airtransport Company is also making preparations for the test flight on Daihoku-Bankok Line via North China and Hanoi covering the distance of 2,800 km. and for the inauguration of new air-lines—Fukuoka-Shanghai line, Tokyo-South Seas Island line and Tokyo-Sapporo line. 20 expert pilots were recently employed to work on these scheduled lines.

Use of Metals in Aircraft

THE use of metals in aircraft construction is rapidly becoming one of the most important phases of the aircraft industry.

The metals used in the present day aircraft are as varied as the uses to which they are put. Of course there are certain properties which are common to all materials used in aircraft construction, and which should be given careful study. The most important properties of these metals are their hardness, density, elasticity, and toughness.

The hardness of the materials has a definite bearing on the strength and toughness of the metal and is sometimes used to distinguish one material from another.

There are several standard tests for hardness. The Shore Scleroscope test involves the height of rebound of a small diamond pointed hammer falling freely from a height of about twelve inches above the material tested.

The Rockwell ball indentation test involves the depth a small steel ball is pressed into the material by a pre-determined force.

The term density used in aircraft construction is known as the weight per cubic foot of specified materials. The aircraft material is usually spoken of as the ratio of its strength to its weight. The strength is the maximum stress, the load the material will develop per square inch. The weight is taken as the density.

TABLE 1—DENSITY OF SOME AIRCRAFT MATERIALS

Material	Pounds per Cubic Foot
Steels	480
Duralumin	175
Spruce	27

The term elasticity is a measure of the elasticity or stress of certain materials. The stress limit of the material, if exceeded, will cause permanent distortion of the material, although generally the material, except wood, will be as strong as before distortion.

Usually the stress limit of the materials is about one-half to three-fourths of its full strength.

TABLE 2—ELASTICITY OF MATERIALS IN AIRCRAFT CONSTRUCTION

Material	Pounds per square inch
Chrome-Molybdenum	29,000,000
Steel	28,000,000
Duraluminum	10,000,000
Spruce	1,300,000

Materials used in aircraft construction should be unusually tough to perform their duties and still leave a degree of safety. There is no place in aircraft construction for materials which are brittle and break easily when subjected to sudden shocks.

Aircraft materials are also subject to several other stresses such as tension shear, bending, and compression stresses. The tension stress is type which tends to pull the fibers of a material apart. The compression stress is

(*Concluded on page* 71)

Landing Gear Shock Stresses

by RAOUL J. HOFFMAN

Here, the author discusses and furnishes data on landing gear calculation that will be of interest to all lightplane builders and designers. Shock-absorber systems are of the greatest importance as a safety factor.

FOLLOWING the war, the requirements for the landing-gear structure were increased to a design load factor of nine times its static weight even when tests showed that, at the failure, the war planes had a load factor from 2.6 to 5.9.

These tests were conducted without investigating the absorbing qualities of the shock absorber unit and, further, to make certain, purchasers even asked the manufacturer to use a design load factor of sixteen. This, of course, was rejected with a suggestion that the pilots be given a more exacting physical examination to protect the equipment.

But not all landing crack-ups should be blamed on the pilot. A considerable number were caused by poorly designed shock-absorber units. The first specifications of the Department of Commerce, arrived at by computation, were too conservative, which caused the pilots to remove some of the shock-cord for easier taxying.

After exhaustive tests, the Department added a load drop test to insure safety and to correct the designed shock-absorber units. A table of detailed specifications will be found accompanying the article.

The drop test must be made with the complete fuselage and landing-gear under full load conditions, without subjecting any structural member to a load greater than its maximum design load.

Before going into details, we will define the meaning of the kinetic energy often mentioned in this article.

When a body is moving with a certain velocity, it possesses energy of motion or kinetic energy, capable of doing work; when a body is dropped from a height it possesses a kinetic energy at the point it reaches the ground equal to the work required to lift the body to its original position, and equal to the weight times the height; work and kinetic energy expressed in in.lbs.

To absorb the kinetic energy, the landing-shock, we have to create a resistance over a certain distance, or compel the shock-unit to do a work equal to the average force times the distance traveled. The maximum resistance should not be higher than the design load factor. Graphically represented, as in Fig. 1, this is called the "work-diagram."

The usual interest in preliminary airplane design is the weight required to absorb the kinetic energy created by the drop; this weight will be the same wherever it may be placed if the elongations of the shock units are geometri-

U.S DEPARTMENT OF COMMERCE REQUIREMENTS FOR LAND-TYPE LANDING GEAR:

LEVEL AND THREE POINT LANDING: APPLIED LOAD FACTOR TO LANDING GEAR STRUCTURE

FOR AIRPLANES LESS THAN 1000 POUNDS GROSS WEIGHT = 3 + 1.33 WING LOADING

" " OVER 1000 POUNDS GROSS WEIGHT = $2.80 + \frac{9000}{W + 4000}$

W = GROSS WEIGHT IN POUNDS. WINGLOADING IN POUNDS PER SQUARE FOOT

IN ANY CASE THE VALUE OF APPLIED LOAD FACTOR NEED NOT EXCEED 4.33

WITH A FACTOR OF SAFETY OF 1.5 THE DESIGN FACTOR WILL BE 6.5

SHOCK ABSORBERS TO TAKE A FREE DROP FROM A HEIGHT IN INCHES EQUAL TO .38 TIMES THE CALCULATED STALLING SPEED IN MILES PER HOUR NOT OVER 18 INCHES FOR CONVENTIONAL AIRPLANES.

SHOCK ABSORPTION PER POUND MATERIAL:

STEEL: SPRINGS - 1000 IN. LBS. PER POUND

WOOD: SPRINGS 1100 IN. LBS.

RUBBER: COMPRESSION 4000 IN LBS.

TENSION (DEPT OF COM. SPEC. 100% ELONG) 11,800 IN.LBS, COM'L 14,700

TORSION FINE STRANDS 35,000 IN LBS

EMPIRICAL FORMULA: 5/8" SHOCK CORD, MAX. LOAD 6.5 TIMES STATIC WEIGHT.

TOTAL LENGTH = STATIC WEIGHT X (DROP - TREAD OF TIRE) / .137 PLUS 8"

NUMBER OF STRANDS = 6.5 X STATIC WEIGHT / 280

TRAVEL = (DROP - TREAD OF TIRE) X .315 IN POUNDS AND INCHES

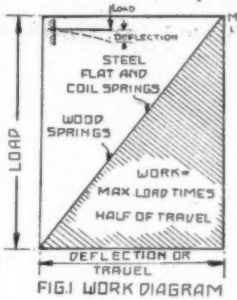


FIG.1 WORK DIAGRAM

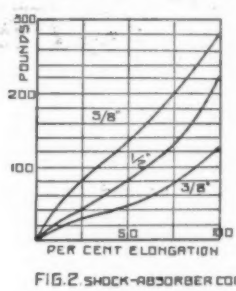


FIG.2 SHOCK-ABSORBER CORD

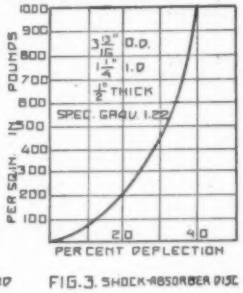


FIG.3. SHOCK-ABSORBER DISC

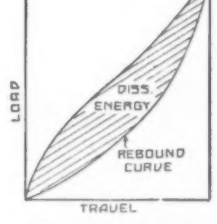


FIG.4 SHOCK-ABSORBER CORD

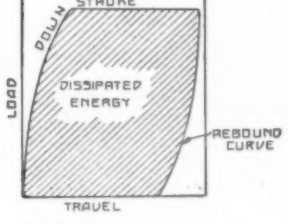


FIG.5. HYDRAULIC STRUT

WEIGHT OF SHOCK CORD: 3/8" DIA. .05 LBS P. FT .416 LBS P. 100 IN.

1/2" " .084 " " " .7 " " " "

5/8" " .14 " " " 1.7 " " " "

WEIGHT OF RUBBER DISC $3\frac{13}{16}$" O.D. X $1\frac{1}{4}$" HOLE - $\frac{1}{2}$" THICK .222 LBS.

WEIGHT OF HYDRAULIC SHOCK STRUT: 1 LB. FOR EACH 1000 TO 2000 IN LBS.

XUM

cally similar; the change of lever arm will not alter the weight used.

The ability to absorb the kinetic energy, known as the resiliency of the material, varies widely. Diverse materials or device used for shock units, such as: steel, wood, rubber, air, friction and resistance of fluid flowing through orifices. Steel has a resiliency of 1000 in. lbs. per pound, wood 1100 in.lbs., rubber in compression 4000 in.lbs., and rubber in tension 11,000 to 15,000 in.lbs. This indicates that rubber is the most suitable material to use for shock-absorber units.

Tests have shown that the energy is not only taken by the shock unit but by the deflection of the tires, the giving of the ground, the flexibility of the wheel, the axle and the rest of the structure. The shock absorbed by the unit was only half of the kinetic energy. About 8 percent was taken by the axle and 4 percent to 5 percent by the wheel (tires excluded). The wheel absorbed the load recommended times the tread of the tire.

The work diagram gives a clear view of the energy absorbed. Fig. 1 represents a work diagram for wood or steel springs, where the points of load against deflection are on a straight line. Then the work necessary to deflect the spring is equal to the area below the line and, in our case, equal to the maximum load times half the deflection or travel. The load diagram for rubber shock cord of various diameters is shown in Fig. 2; and for rubber disc in Fig. 3.

Evaluating the work diagram in Fig. 2 we find the 5/8" dia. —1" long cord can absorb 137 in.lb. energy, with an initial tension of 50 lbs. and a 1/2" dia. —1" long cord 92 in.lb., both stretched to 2 in. length.

Above data will result in formulas noted on the table sufficiently accurate for estimating purposes. Do not forget to add a few inches to the length of the cord for assembly purposes. In case the travel of the shock unit is not equal to the travel of the wheel axle the number of strands is inversely proportional to the reduction of the lever arm.

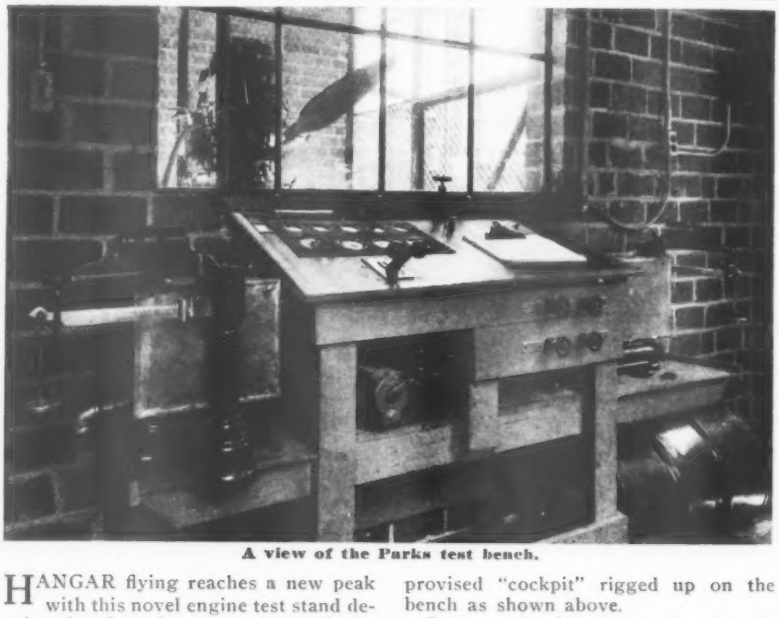
Interesting tests on conventional airplane were made and showed that the load factor for a three point landing is 2.1 to 2.8 for taxying 3.0 and for gliding straight into the ground 4.1. This indicates that taxying on an average airport puts the heaviest load on the landing gear structure.

After the first impact, the shock unit and the tire compress; the deflected unit possesses potential energy (energy of position) which tries to push the airplane back to its original height; but not all energy is available, for some of it has been dissipated. In case the curve for the return stroke is not the same as the down stroke curve the area between the two curves is the energy dissipated.

There is hardly any energy dissipated by steel or wood springs. Tests show that the dissipation of a tire is from 10 to 20 percent and for shock cord from 30 to 40 percent.

(*Concluded on page* 65)

Engine Test Stand Developed at Parks



A view of the Parks test bench.

HANGAR flying reaches a new peak with this novel engine test stand developed and put into operation at Parks Air College, East St. Louis, Ill. The airplane engine, seen through the window, is literally "flown" from the improvised "cockpit" rigged up on the bench as shown above.

Seen on the bench are the throttle and gasoline mixture bars, ignition switch, primer and regular aircraft engine instruments.

Why Lightplanes Cost Real Money

by ROY P. FRY

THERE seems to be a general opinion on the part of the general public that everything connected with aviation is way out of reason in price and, the reason,—well, if for no other reason than the fact it is connected with aviation.

This same opinion seems to be held by many amateurs. In fact, I have talked with a few amateurs who seemed to be steeled on the subject. I think the great trouble is that we do not think.

I do not say that all prices are within reason in our beloved field of aviation, but I will say that, as a whole, they are figured about as close as is practical, or even possible if the industry is to continue to exist. Consider, for the moment, the price of aircraft and motors.

True, they are much higher than automobiles, but on the other hand the expenses of an aircraft factory compare favorably with that of the automobile factory. Yet it is an impossibility at present to sell enough aircraft to the public so that mass production can be entered into, the result being that the entire cost of production has to be met by, let us say, a hundred aircraft per year by the factory as against a million cars per year with the car factory in the low price field.

On the other hand, the skill and highly trained workmen in the aircraft factory are far greater than the car factory. Many men have worked years in modern car factories, yet know less about the car they build than the average man who buys it.

Let's picture our present aviation field, the commercial operator and the amateur and home-builders. On one hand we find the so-called high prices, and on the other hand we find prices in the amateur field so low that it would indicate that either our home-built jobs are so cheap as to be dangerous, or else the commercial operators are conducting a wholesale robbery.

Right here lies a lot of the difficulty the amateur now finds himself in. In the first place he is giving the general public the idea that his product is cheap junk, and not safe to be flown. Thus he has lost the good will of the one to whom he should be able to turn for justification and protection.

And last, but not least, he gives an impression to the public that the commercial operators are only after their money on a large scale to be classed as robbery or a racket. He ruins the market with his product when he offers it for sale at what he might call a fair cost, when in reality it is much less than the actual cost.

We have all heard some of the home builders claim that they built their plane for a cost of $200.00 and less, and

(*Concluded on page* 62)

Stress Analysis Made Painless

by

LOUIS STRAUSS

ONE of the fundamental items to be learned in the study of stress analysis is the calculation of the moment of inertia. Before we go any further I wish to state that the name moment of inertia is very misleading as there is no inertia whatsoever in it. It is mainly a name given to a symbol which is in many formulas.

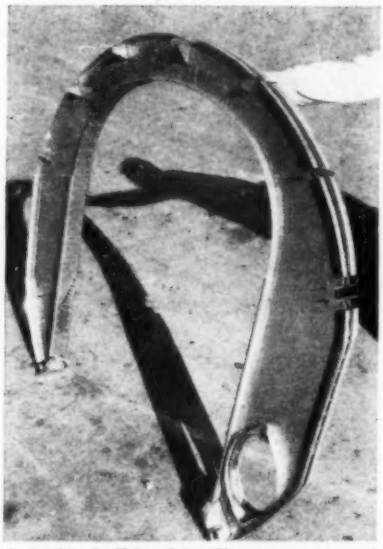
The most important formula utilizing the moment of inertia is as follows: $f = MC/I$; f is the stress in pounds per square inch; M is the moment in inch pounds of the particular section to be analyzed; C is the distance in inches from the neutral axis of the same section to the outermost fibers; and I is the moment of inertia of the section in inches to the fourth power.

When analyzing an airplane wing or fuselage, this same formula is used for calculating the stresses at various stations along the span of the wing or along the fuselage. In every case the moment of inertia, which will be called by the symbol I, has to be figured.

A brief outline of what has to be known before the stress can be solved is as follows: (1) The moment which an external force places upon the part to be analyzed. (2) The neutral axis of the critical section. (It is the distance from this axis to the outmost fibers that we are interested in.) (3) The moment of inertia of the section.

In this article I will attempt only to show how the neutral axis and the moment of inertia are calculated.

The neutral axis divides the section into two parts so that the area of the material on one side of the axis is equal to the area of the material on the other. (For solid symmetrical sections.) This will be made clearer further on by simple examples.



A double bulkhead landing-gear support in which the calculation of the "I" is necessary.

I, without going into calculus can be said to be the sum of the products of each elementary area and the square of the distance from the axis that I is taken about.

Let us take a few simple examples to further explain I. Figure 1 shows a rectangular section of a beam with a base of 3" (b) and height of 6" (h). The formula of the I of a rectangle is $bh^3/12$. This I is with respect to the axis X_o which is called the neutral axis, and is located in the center of the rectangle. I would be equal to $3 \times 6^3/12 = 54$ inches^4. If the I of the rectangle is wanted with respect to its base, the formula would be $bh^3/3$. Therefore $I = 3 \times 6^3 = 216$ inches^4.

Looking at figure 2, we see that the neutral axis of a triangular beam section is 2/3 times the height, measured from the top. The I of a triangle with respect to its neutral axis is $bh^3/36 = 3 \times 6^3/36 = 18$ inches^4.

Figure 3 shows a solid circular shaft. The I of a circle with respect to its neutral axis, which goes through the center of the circle is $\pi r^4/4$, r being the radius, $= 3.14 \times 3^4/4 = 63.58$ inches^4.

These three figures represent the most important formulas for calculating the I. Many different I's can be calculated from these. For instance, looking at figure 4, we see that it is a section of a hollow shaft. Naturally the part that we are interested in is the I of the shaft itself and not of the shaft with the hole included as would be done with a solid shaft. Therefore I for the shaft is the difference of the I's of the outer and inner circles, $= (\pi r^4/4 - \pi r'^4/4)$ where r is large radius, and r' is small radius, $= 3.14 \times 3^4/4 - 3.14 \times 2^4/4 = 63.58 - 12.56 = 51.02$ inches^4. This system also applies to the rectangle, triangle, and all other similar figures.

If we have an angle such as figure 5 represents, and we wish to find its I the procedure is somewhat different. You will notice that the angle can be broken into two small rectangles No. 1 and No. 2, both on top and bottom of the neutral axis. The I of the two rectangles No. 1 and No. 2, is found in the following manner with small explanation proceeding.

If the I of a section is wanted with respect to an axis not its neutral, the formula $I_x = I_{xo} + Ad^2$ is used. I_x is the I of the section being considered with respect to another axis not its neutral; I_{xo} is the I of the section with respect to its neutral axis. This is shown clearly in figure 6.

The I of the two rectangles of figure 5 can now be calculated. $I_{x1} = 2 \times 1^3/12 + 1 \times 2 \times (2.5)^2 = .166 + 12.5 = 12.666$ inches^4. This has to be multiplied by two as there are two rectangles, on top and bottom, having the same properties. $I_{x2} = 1 \times 2.5^3/12 + 2.5 \times 1 \times (1.75)^2 = 1.3 + 7.65 = 8.95$ inches^4. Therefore I of the entire section is equal to $2 \times 12.666 + 2 \times 8.95 = 43.232$ inches^4.

This last relationship should be remembered, as a great many times the axis about which the I is calculated is not the neutral axis.

If you should have a section such as shown in figure 7, the neutral axis, is not through the center but at some position which will have to be calculated. The reason for the axis not going through the center is obvious since the figure is not a symmetrical one such as

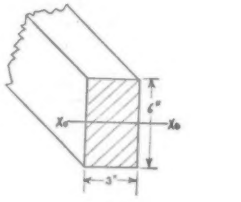


Fig. 1

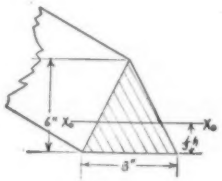


Fig. 2

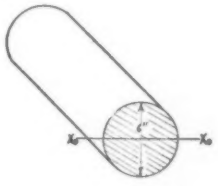


Fig. 3

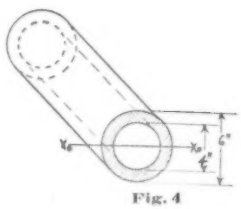


Fig. 4

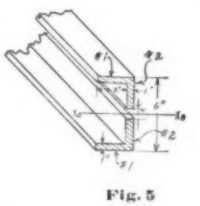


Fig. 5

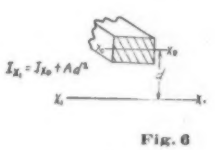


Fig. 6

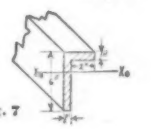


Fig. 7

Typical cross-sections of bars and beams commonly used as structural members.

figure 5 represents (symmetrical about the neutral axis).

The location of the neutral axis is calculated by multiplying the areas of the two rectangles No. 1 and No. 2, by their respective distances from any outside axis (X) to the neutral axes of the two rectangles, adding them together, and then dividing by the total area of the section.

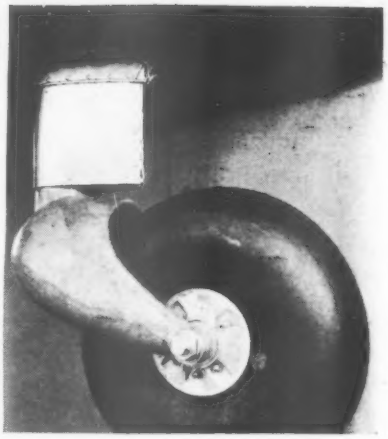
The neutral axis of figure 7 is calculated as follows. The area of rectangle 1, $= 2 \times 1 = 2$ square inches and its neutral axis is 5.5 inches from X; the area of rectangle 2, $= 6 \times 1 = 6$ square inches and its distance from X to the neutral axis of this rectangle is 3 inches. The total area $= 2 + 6 = 8$ square inches. The neutral axis $= 2 \times 5.5/8 + 6 \times 3/8 = 11/8 + 18/8 = 29/8 = 3.625$ inches from X.

The I of the section is calculated by using the formula $bh^3/3$, which is the one previously mentioned as being the I of a rectangle with respect to its base. This will get us the I of rectangles No. 2 and No. 3. The formula $I_{sd} + Ad^2$ will have to be used for calculating the I of rectangle No. 1. The I of the section is $= 1 \times 1.8125^3/3 + 1 \times 2.375^3/3 + 2 \times 1^3/12 + 2 \times 1 \times 1.875^3 = 1.985 + 4.45 + .166 + 7.04 = 13.641$ inches^4.

In order to get the required amount of metal, the I of that section has to be calculated and placed into the formula $f = MC/I$. This gives us the stress of the section we are analyzing. Since we know the maximum allowable stress which the material has, the margin of safety can be calculated. The margin of safety (in %) = allowable stress $\times$ 100/actual stress $-$ 100.

If our actual stress as calculated is much less than our allowable, then our margin of safety is great. This will mean that our material will have to be cut down. In doing that our I will increase and thus increase our stress. Our margin of safety will then become lower.

Assuming now that you have the principle of calculating the I, we will delve into a discussion of I as further applied to aeronautics.



Tail-wheel of the Douglas Transport.

The wing and fuselage of an airplane are being made of metal more and more. In a few years practically all aircraft will be manufactured of metal.

One of the main problems involved in metal construction is that of providing the correct amount of metal through critical sections of the plane. By this, I mean having the longerons and skin plating just the right thickness so as to give a fairly good margin of safety for every section in the airplane.

Should a thick skin be placed upon the fuselage it will naturally increase the margin of safety but at the same time it would cause an unnecessary amount of weight to be added. This of course reduces the pay load.

The neutral axis as calculated pre-

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TABLE I
COMPRESSION ON BOTTOM

PART	AREA	Y	AY	h	Ah²	Io
No. 1	.440	5.60	2.461	8.52	31.92	SMALL
No. 2	.440	7.56	3.324	20.28	181	"
No. 3	.440	7.56	3.324	20.28	181	"
No. 4	.440	5.60	2.461	8.52	31.92	"
No. 5	.464	2.75	1.278	8.58	34.18	"
No. 6	.464	.81	.376	20.22	190.1	"
No. 7	.464	.81	.376	20.22	190.1	"
No. 8	.464	2.75	1.278	8.58	34.18	"
A	.040	6.97	.276	16.32	10.68	6.67
B	.040	6.97	.276	16.32	10.68	6.67
Total	3.696	4.18	15.430		895.76	13.34

(Slide Rule Accuracy)

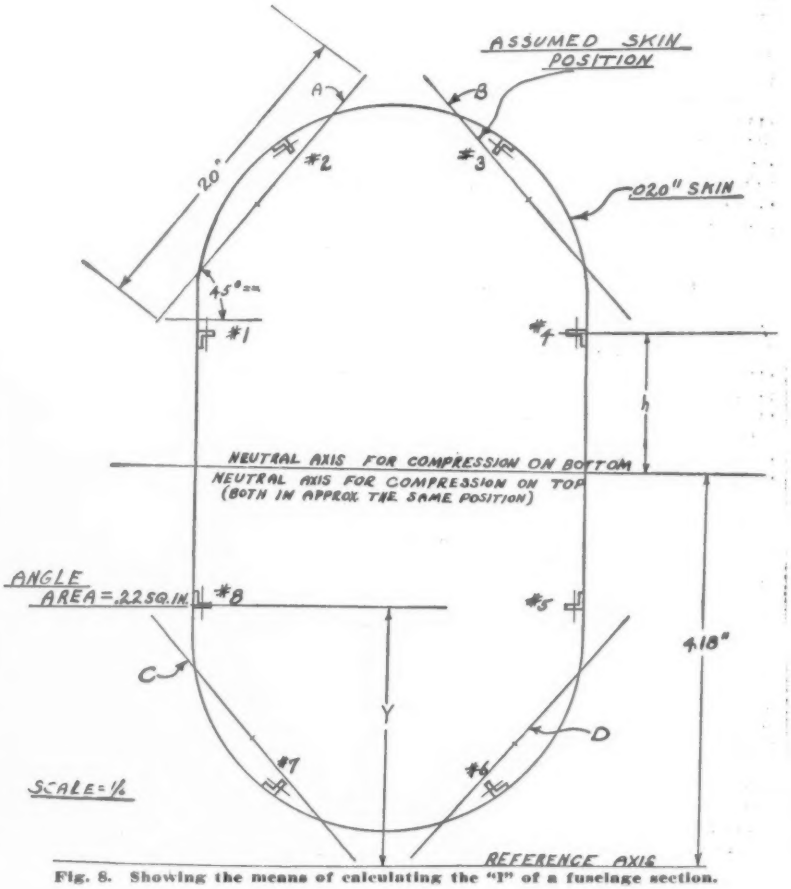
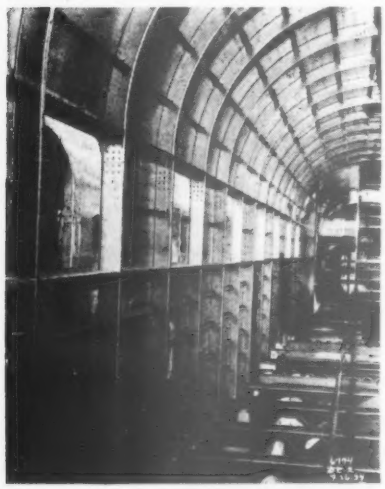


Fig. 8. Showing the means of calculating the "I" of a fuselage section.



Interior of a metal fuselage showing the stringers and bulkheads.

Cow Pasture Notes

FLYERS have learned something from the humble cow. Because cows always stand with their tails to the wind, airmen aware of this fact have been immeasurably aided when making forced landings in the country because of engine failure.

Transatlantic Airline Progress

NOW that leaders in aeronautics on both sides of the Atlantic are turning their attention to development of a transatlantic airplane line, Imperial Airways of Great Britain is planning a startling experiment. The big British company will share a seaplane base at Bermuda with Pan American Airways, and will have another base at Newfoundland.

Skeptical of the feasibility of giant transatlantic flying boats for non-stop Europe-America hops, Imperial Airways has put its engineers to work developing a comparatively small, efficient long-range plane which will be helped into the air by a "porter" plane, after which it would be on its own for the next 2,000 miles or so.

The long-range machine would be loaded heavier than a commercial plane has ever been loaded before, and would get into the air in tow of the porter plane. Its 2,000-mile flight would use up so much fuel it would be light enough to make a safe descent in the harbor. An exhaustive test of this theory is planned later in the year.

However hazardous such a flight may appear, it still remains that the ocean flyer does not meet with the same hazards as an over-land flyer when we consider the dangers of rough terrain, the danger of bumping into mountainsides and the like.

The W. P. A. in Illinois

ALL of Illinois' WPA aviation projects either are under way or are about to start. That state's six municipal airports are taking advantage of the opportunity for rehabilitation offered them. That they really need the assistance is proved by the fact that Bureau of Air Commerce inspectors have approved each project and WPA funds have been appropriated.

The majority of the rest of the 48 states undoubtedly have a larger number of eligible municipal airports than Illinois. Michigan, for instance, has close to 50 publicly owned fields.

Difference in each state's number of municipal airports generally is laid to that state's land values. Michigan's land, comparatively low priced, doesn't compare with the high values placed on Illinois property. Hence, communities in Illinois find it more difficult to afford ample acreage for airports.

But what once would have been a stiff financial blow to a community's purse-strings now has been very substantially

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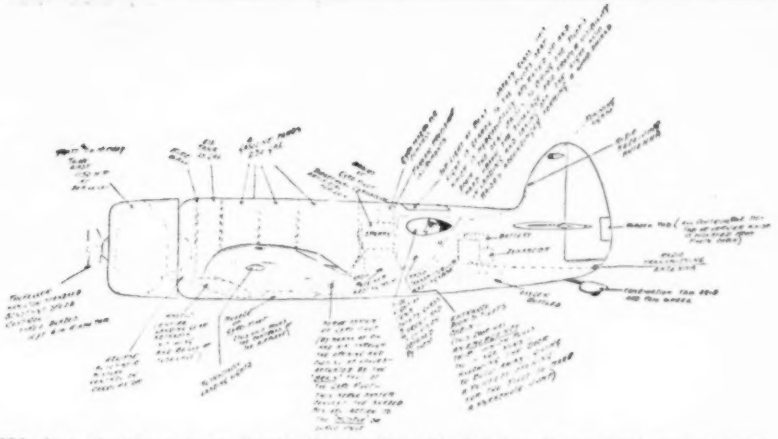
Frank Hawks Prepares for Stratospheric Flight



This is a sketch made by Frank Hawks himself, showing the general arrangement of his new plane.

"BRILLIANT in conception and scientifically guarded against any possibilities of error."

That is the judgment of Dr. Alexander Klemin, director of the Guggenheim School of Aeronautics, on the teamwork of Lieutenant Commander Frank Hawks, famous speed pilot, and Howell (Pete) Miller, famous aeronautical engineer, in the design and construction of Hawks' latest and fastest Wasp-powered airplane. Hawks has christened the new ship "Time Flies."

"A sound ship, with very desirable aerodynamic characteristics," Dr. Klemin said of the airplane, the model for which was tested with his co-operation in the wind tunnel of the Guggenheim School at New York University.

"It is well ahead of current practise," he added.

The ship was built by Hawks Aircraft, Redding, Conn., and sponsored by The Gruen Watch Company.

Hawks himself says of it:

"High speed with safety and the utilization of every modern device for both safety and the proper operation of aircraft are my goals in this venture. This airplane has all the speed of a racer, with the practicability and installed devices of the most modern transport airplane. It is roomy enough to carry a large complement of instruments and radio equipment, permitting scientific research not possible in a small racing plane. In other words, the biggest little ship in the world."

The plane is a semi-low wing cantilever monoplane, completely streamlined.

Its fuselage is 22 feet long, constructed of Summerill chrome-molybdenum steel tubing, with streamers to give ordinated streamlining. The fuselage is covered with Haskelite plywood. The interior structure of the fin is steel tubing, with plywood ribs. Cantilever construction is used in the stabilizer. Stabilizer, rudder and elevators have spruce spars, maple corner blocks and plywood.

Box type construction is used in the tail-group, all of which is covered with plywood. The rudder is streamlined into the fuselage. A tab built into the rudder may be set from the cabin, in the manner of a vernier, to trim the ship while in flight to take the stick-load from the regular controls. Similar vernier tabs in the elevators and ailerons provide for similar settings, to make lighter the pilot's task on long flights.

Hawks declines to reveal the ordinates of the streamlining, as well as two technical refinements embodied in both the wing and fuselage, beyond saying that they aid the speed and stability of the plane.

The cantilever wing, of 31 foot spread, contains three spruce spars boxed with plywood, has plywood ribs, maple corner blocks, is of box type construction, and like the fuselage and empennage, is covered with plywood.

The tail skid is streamlined by a form made of aluminum in its upper part and at the bottom of sta-light, a substance manufactured to protect metals that are subjected to excessive wear. Within the streamlined form is a small wheel which protrudes sufficiently so that the wheel carries the load when landing on an asphalt or concrete runway. The lower part of the skid takes the brunt when landing in softer fields.

The motor is the military type Pratt & Whitney Twin Wasp, R-1830 BG, developing 1,150 horsepower at sea level, with automatic mixture control and high altitude super-charging. It was released to Hawks by both army and navy for this project.

Top speed at sea level is estimated at 375 miles an hour; cruising speed, at 13,000 to 15,000 feet altitude, 340 miles an hour, using 600 of the available 1,150 horsepower at the most economical throttle setting. Climb at sea level will be 7,000 feet a minute and landing speed, through the use of land-

(*Concluded on page* 70)

December Is Eventful In Aviation

by

ERNEST JONES

Early Bird and pioneer in American Aviation.

1783. Dr. Samuel Johnson and Benjamin Franklin were writing to friends of hydrogen balloon development. Franklin wrote: "Nothing is now wanted but some light, handy instruments to give and direct motion." On Dec. 1 Prof. Charles and one of the Roberts brothers made the FIRST FREE HYDROGEN ASCENT and marked the FIRST USE OF THE VALVE, NET AND BALLAST—launching a century of exhibition ballooning. Lieut. Meusnier presented to the French Academy a paper on the equilibrium of aerostatic machines and included minute designs for a 6-passenger AIRSHIP which Louis XVI vetoed on account of the 3,000,000 franc anticipated cost. On the 26th of Dec. Le Normand demonstrated the PARACHUTE by dropping from a window of a house in Lyons.

1784. Jos. Montgolfier was putting the last stitches in a MONSTER BALLOON of 540,000 cubic feet which ascended the following month with a load of 2½ tons.

1792. The famous French balloonist Blanchard completed arrangements for the FIRST AIR VOYAGE IN AMERICA from Philadelphia, then the capital, carrying a letter from President Washington.

1843. On Dec. 20 Senator Stephen A. Douglas asked Congress for $15,000 to finance John Wise's TRANSATLANTIC BALLOON project. Wise claimed to have discovered an easterly current which would enable circumnavigation of the globe in 30-40 days. "It would enable us to leave despatches in Europe and China and return by way of Oregon Territory to Washington City," said Wise. The Committee on Naval Affairs allowed the bill to sleep.

1846. The Government was no more interested in aeronautics this year when Wise offered Secwar Marcy a plan for the AIR CAPTURE of the castle of San Juan de Ulloa.

1894. A company of the Spanish telegraph battalion detached to form the nucleus of a balloon corps.

1893. C. L. Vaughn, an exhibition aeronaut, was thrown through the window of the town hall at Centerville, Calif., and injured as the FIRST AIR APPROPRIATION BILL was being introduced in Congress by Senator Cockrell. Drafted by James Means, the bill called for payment of $100,000 to any inventor who would, before 1900, construct a "vessel that will, on the verified report of 3 engineers appointed by the Secwar, demonstrate within or near the city of Washington the practicability of safely navigating the air at a speed of not less than 30 miles an hour and capable of carrying passengers and freight weighing a total of at least 5 tons." Needless to say, the bill did not pass.

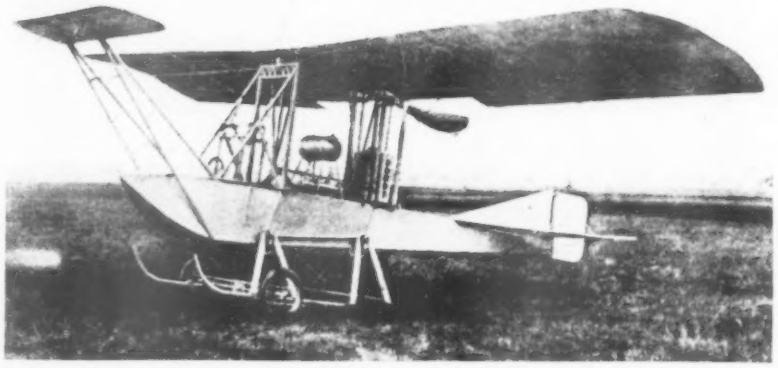


Figure this one out. An early pusher with chain-driven propeller, tractor type fuselage and canard elevator. The brain child of M. Levesque who added the skids as an after thought.

1895. Another bill of Means, introduced by Senator Lodge, called for another $100,000 for a similar performance but the payload was cut to 400 pounds. The bill also offered $25,000 for a mile glide—gas barred. The requirements were fulfilled by the Wrights in 1908.

1898. Aviation fans were trying to make up their minds on A. M. Herring's claims of a POWER FLIGHT carried in the Chicago Evening News.

1902. Hugo Mattulath was gathered to his fathers. He had become widely known for his proposed MONSTER COMMERCIAL SEAPLANE. His patent application was one of those cited by Curtiss in the Wright-Curtiss suit. In the same month Victor Tatin exhibited in Paris the *Ville de Paris*, a great semi-rigid AIRSHIP designed for Baron Deutsch de la Meurthe.

1899. A second allotment of $25,000 was made to LANGLEY by the Army's Board of Ordnance and Fortifications.

1903. On Dec. 14 Wilbur Wright made the WORLD'S FIRST POWER FLIGHT of 105 feet. The machine was slightly damaged in landing on the dunes of Kitty Hawk. On the 17th Orville and Wilbur both made flights, the longest 852 feet in 59 seconds against a 20-mile wind. Four flights were made this day by the two brothers, each flying alternately. It fell to the lot of Wilbur to make the longest. After the last, a gust of wind turned the machine over and further flights were discontinued until the following year at Dayton.

On Dec. 8, 1903, was made the second and last test of the LANGLEY AIRPLANE over the Potomac, piloted by the late Charles M. Manly. The machine was launched from the roof of a houseboat, but the control surfaces were broken in the attempt. Further experiments discontinued.

1904. The LEBAUDY II, one of the series of great French airships, was flying and the gasbag was being groomed for the air war of the future.

1906. Second AIR EXHIBITION of the Aero Club of America held in connection with the auto show in Grand Central Palace.

1907. On Dec. 16 the Signal Corps called for bids on the FIRST AMERICAN ARMY AIRSHIP. On the 23d the Corps advertised for bids on the FIRST GOVERNMENT AIRPLANE, after an injection of airplane bacilli by Army attaches in Europe who were reporting the success of the Wrights' negotiations in Europe and the British Isles and the hops of Farman and the others in France. The CSO asked for prices on an airplane capable of operating in any country encountered in the field service without requiring a specially prepared spot, simple of construction, easy to fly, quickly demountable, with a speed of 40 mph with two up for one hour. The Wrights were the only bidder in a field of 22 to produce a machine.

(*Concluded on page* 52)

—And Now We Hear the Other Side

by MAX KARANT

Max Karant, who, as you remember, flew the Hammond experimental plane without previous piloting experience in any plane and wrote a story about it in the October issue, now replies heatedly to his several critics.

MAYBE it's going to cost me all my friends among aviation's old timers but I'll stick to my conviction that the Air Commerce Bureau's development program is something aviation as a whole has needed for many years.

I sincerely respect the veterans in the industry who had the courage to stick it through to aviation's present status but I also think myself justified in filing a complaint against those men who refuse to take a decisive step forward and try to keep others from doing so.

Last month's issue of POPULAR AVIATION carried the column by a colleague of mine who, to my way of thinking, needs a top overhaul. Swanee Taylor had a fine time rambling along with his typically gallant flourish but — he skipped a few pertinent facts (either purposely or otherwise) with which I want to take issue with him. After all, even a few thousand hours in the air doesn't make a man infallible, as Swanee's "critique" of me proved.

My article in the October issue of POPULAR AVIATION has, it seems, caused quite a flurry. That is, judging from the amount of mail this magazine has received. It's pleasing to note that the majority of comment is not only on my side but quite emphatically so. Which, I believe, justifies what I have to say to my self-appointed godfather, Mr. Swanee Taylor.

Y'know, Swanee, I've always admired you for your ability as a colorful author. Yeh, I know you've mauled the old joy stick around for many years but, well, so what?

First off, if you think you're justified in putting up such a foolish howl for your little tin gods on pedestals that's all right with me. Which reminds me. We (several of your old-timers, Swanee, and myself) have been having a mild sort of hysterics over that glorious bit of applesauce of yours: "I've yet to discover a mean, knavish, unmoral or dishonest deed anywhere in our Beloved Industry." Men, you've sure lived a shielded life! Where have you been all these years, Swanee? Or are you just practicing up to be a political speech writer?

Really, though, I don't think the manufacturers deserve the gallant plugs you give them in your column. What have they actually put on the records if what you say about their progressiveness is true? Present-day ships are just glorified models of the old reliable OX-5 jobs. You mention the Guggenheim competition of several years ago. But you neglected to say that the winner of that competition, the famed Curtiss ("World's Safest Airplane") Tanager, cracked up shortly after it won the prize *and put the pilot in the hospital.*

And this is the Hammond plane which has been the basic cause for so much argument. Time will tell the story of its adaptability.

Did that happen to slip your fertile memory, Swanee? Too, your claims that the industry as a whole is striving mightily to produce an airplane that will "suit the needs and pocketbook of Mr. and Mrs. Everyguy" is so much prop wash. The only really radical advance I can think of in recent years was Juan de la Cierva's autogiro.

Would I be too bold, Swanee, if I reminded you that the industry laughed quite heartily at Mr. Cierva's "windmill" (like they're doing today about Vidal's "pipe dreams")—until he showed them their "modern aircraft" couldn't hold a candle to the 'giro's flight characteristics. Come, now, Swanee, where have you been these years?

You say "we have four splendid little ships selling like hotcakes" today. I'm taking it for granted you offer this as an example of modern progress in the private airplane market. Ye gods, Swanee, all these companies together are only selling slightly over 1,000 ships a year in this country while, to all appearances, we could sell more than 1,000 of the ships the Bureau is trying to develop to POPULAR AVIATION readers alone!

Do you call that progress or prosperity in the private plane market today? Especially with some 120,000,000 people in this land? Why, the automobile industry today is only slightly older than aviation but that industry's manufacturers have been "radical" enough to perfect their product to where, from as high as $5,000, the standard automobile has been brought down to its present easy-to-own price class. And it's ten times better than the $5,000 job, Swanee—and they're selling not one or two thousand but *millions.*

Why is that? Well, the auto builder realized that the entire human race is made up of "nuts behind the wheel" as you called us plane prospects so importantly, Swanee. So these manufacturers proceeded to perfect their products to the point where, today, they're as foolproof as can be—and you must admit the airplane is far from that.

In other words, Swanee, your knowing bit of ridicule of the air-minded man on the street is something you should be ashamed of. You nor anyone else has any right to call us average guys who want to own and fly our own ships a bunch of blockheads. Which is figuratively what you did when you referred to the Bureau's efforts as seeking a "damned-fool proof" airplane. Well, I and practically every other enthusiast in the country would be a damned fool in that case—but I believe you yourself reversed that situation.

Apparently you are having a hard time getting it through your head that, in the final analysis, these damned fool "nuts behind the wheels" are the fellows who will make or break the aviation industry in years to come.

It's all right to be a veteran airman and let the world know it but you old timers will either have to do your best to actually (not theoretically) help make the private airplane suit the needs of all us fools or at least let others try. Mainly because the money that will build up this huge, untapped market will come out of our pockets, not yours, and all your flashy remarks won't alter that situation one iota.

Now I don't care a hoot about the Bureau of Air Commerce under other conditions, Swanee, but your inferences that I gained my "aeronautica" from Eugene Vidal would suggest that you, in your attempt to slap your cohorts on their backs have hit below the belt.

Even if I were one of Mr. Vidal's bosom pals (which I'm not; I've met him once in my life) that would be beside the point. I say this because you, Swanee, know me well enough to know I wouldn't do that sort of thing under

XUM

any circumstances. I happen to be sincere in my belief that the Bureau's development project is something that obviously is way beyond certain old-timers' ideas of progress.

While I'm on the subject of hitting below the belt, Swanee, is it necessary that you take advantage of the fact that Eugene Vidal is a public officer? Your remarks may have been paid a little more heed had you not tried to be funny by taking cracks at Vidal's intelligence. In this particular instance—the development program—he's already shown more intelligence than a great many old-timers thrown together.

Of course, Swanee, I realize you're just another one of those guys who are mad as wet hens because, after several months of silence, the truth finally came out when I wrote the facts about that little flying "guinea pig" the Bureau has. As I said in my first article, I went to Washington with an open mind. I was there to see just what all the howling was about and whether or not it was justified.

Well, I found that criticism to be about as vicious a bunch of contemptible lies and evasions on the parts of pseudo-authorities as I've ever seen.

That's another thing, Swanee. You, as well as others of your cohorts, can't seem to get it through your heads that the Hammond *will* outfly anything in the air today. By that, of course, I don't mean in high speed and ability to do snap rolls. I mean in the kind of *safe* performance that we future purchasers are going to demand of the manufacturer. And by golly, Swanee, we're going to get our money's worth and your high ideas won't alter *that* situation any.

Of course, all through your series of jabs at my intelligence and ability, you conveniently ignored the fact that I actually did fly that ship. And incidentally, old boy, you've condemned the idea and all that, but have you ever flown the ship yourself? I thought not.

Well, I *did* fly it and it's nothing more than the first stage up from an experimental toy. When I flew it the Hammond was in its crudest form. No refinements of any kind that had been added *but it still outflew anything in the air today.* Can you deny that, Swanee? So, after having my enlightening little session out at Bolling field that warm July morning, I think I was justified in deciding that the "something" that was wrong was not entirely with the Bureau project.

Do I think the Bureau is infallible? Heavens, no! I've never denied anyone the fact that that government body is overrun with politics and red tape. I know all that and I've taken many a crack at the Bureau of Air Commerce in the past on many counts and for many reasons. Lordy, no living man or group of men is invincible.

But my present "bone to pick" is that, in this particular instance, past differences should justifiably be overlooked and the actual facts of the matter be taken into consideration. Bad

(*Continued on page 73*)

A Chicago Gas Model Club Has Fine Meet

by RAOUL HOFFMAN

Here are the members of the Gas Model Aeronautical Club, Gage Park, Chicago, on their toes with the gas model situation well in hand. This was a real meet that deserves great credit.

THE gas model airplane meet, sponsored by the Gas Model Aeronautical Club of Gage Park, Chicago, was held at the Curtiss-Reynolds airport, Glenview, Ill.

The contest director, Frank Nekimken, president of the club, in co-operation with the judges and the timers, and especially with the weatherman, made the meet a grand success.

It was a great rally of gas model engineers. From Indianapolis came Mr. H. Stoefer and the other half of the firm, Mrs. Thelma Stoefer, who flew her own ship, and Vernon Bailey, the 1935 Moffat champ. From Toledo came C. Hawkins and J. Blank.

One old-timer, with 20 years of flying and model building as his hobby, attracted wide attention: Walter Adams, chief pilot of the United Airlines, made a surprising stable flight of 4 min. 53 sec. with his model.

The awards, too numerous to mention here, were the Five-Year Championship Trophy of the Chicago Park Districts, the Kesl, Aeronut, and Pattis trophies, five medals, a gas engine donated by the Burgess Battery Co., a Megow Gas Model kit, and two subscriptions for POPULAR AVIATION.

There were 32 contestants, and the prizes were awarded as follows: the first to Barney Johnson of Joliet, time 46 min. 4 sec., the second to Miles I. Stone of Joliet, time 12 min. 57.5 sec., the third to Buddy Johnson (brother of Barney) of Joliet, time 8 min. 23.8 sec., the fourth to Melvin Yates of Chicago, time 8 min. 23.2 sec., the fifth to Ch. Thornton, the sixth to H. Bodinat, the seventh to I. Goebel, and the eighth to R. J. Weber, a Megow representer. All are members of the G.M.A. club except the fifth winner.

We wish to mention a few technical details. The average weight of all the models was 4.6 pounds, but the average weight of the models of the first four winners was 6.6 pounds. This indicates that a more efficient weight distribution is feasible with a heavier model.

The average wing-loading was from .50 to .65 lbs. sq. ft. wing area, and the horizontal tail area was 20 to 24 percent. of the wing area. Surprising was the great number of uncowled engines which added resistance to the models and thus reducing their performances.

The chief interest centered on the little gas engines developing ¼ to 1/6 horsepower at 4000 to 4500 R.P.M.; two-cycle engines with a thermal efficiency of 5 percent. and a mean effective pressure of 25 pounds per square inch. The fuel consumption is from 4 to 5 fluid ounces per hour for each 1/10 h.p. For contest purposes, ⅛ fluid ounce is usually allowed for each pound of model, weighing not over 7 pounds. The fluid ounce is equivalent to the volume of hot-water weighing one ounce.

But the gas model engineer has a more practical unit: the eyedropper unit. It takes 16 fillings to make one fluid ounce.

The diameter of the propellers was from 13 to 20 inches, and the static pull on some models was close to the weight of the model. This is one reason for placing the landing gear so far ahead of the center of gravity.

Something new, an extra-light gas model battery manufactured by the Burgess Battery Co., was used first time at this meet.

It seems that, to comply with the weather conditions, the contestants should have two sets of wings, and high and low pitch propellers to get the best performance on a breezy or on a calm day.

This sort of meet is yet in its infancy and after a period of development, will have many effective rules and regulations that will aid the sport tremendously, in furthering the cause of aviation.

Building the Curtiss-Wright Coupe

by
PAUL W. LINDBERG
Model Editor and Model Designer for POPULAR AVIATION

This is a most life-like replica of the Curtiss-Wright Coupe, a model that has good flying performance in addition to good looks.

OUR low wing monoplane for this month is an excellent flyer and a real beauty. It is authentic in every respect with movable controls and all necessary details. After you have completed this attractive model, we know you will set it in a special place for others to admire; for its clean lines and color combination make it an outstanding ship.

COLOR SCHEME

Entire model—silver with red stripe on each side of fuselage.

CONSTRUCTION OF FUSELAGE

It is necessary to place a sheet of ordinary wax paper over the plan to prevent cement from sticking to the plan. In building the fuselage, construct one side at a time. The longerons, vertical and diagonal braces, etc., are held in place until securely cemented, by inserting straight pins on either side of strips.

After the two fuselage sides are completed, they are pinned to top view of the plan in such a manner that the top longerons face down and the sides are at right angles with the table. The cross-members are now cemented in place, forming a rectangular fuselage.

Cut formers from 1/32-inch sheet balsa and cement in their respective positions as shown on plan.

Balsa nose plate is built up from ⅛ sheet balsa.

CONSTRUCTION OF MOTOR

The cylinders are carved and sanded from balsa blocks. When 7 cylinders have been formed, wind heavy thread around them to represent fins. Make crankcase from 1 piece of balsa. Rocker arm housings, push rods and other small details of motor are made of balsa.

CONSTRUCTION OF WING

Cut all ribs from 1/16-inch balsa. Pin the spar in position on the plan. Now, cement ribs in their proper locations. The leading and trailing edges are cut and sanded to shape and cemented to the ribs. The panels carry movable ailerons which are a great help in controlling the flights. Make wing tips from 1/16-inch thick balsa. We highly approve of this type of wing tip, because it is much easier to construct and neater in appearance.

CONSTRUCTION OF ELEVATOR AND RUDDER

These are built from 1/16-inch square and flat balsa, and are constructed on the plan. Their construction is very simple, therefore no difficulty should be encountered here.

CONSTRUCTION OF LANDING GEAR

The construction of landing gear is clearly shown on plan.

COVERING THE MODEL

Apply tissue to the various framework members, using a light grade model airplane dope to fasten it to the outer edges. Stretch tissue as tightly as possible to remove all wrinkles. When edges have dried, apply coat of water to tissue. When all water has dried, apply coat of water to tissue. When all water has dried completely, tissue will become taut. May we suggest that you pin wings, elevator and such to flat surface. This method prevents warping.

ASSEMBLY

After the wing panels have been cemented to fuselage, make fillets from paper and fill in open spaces between fuselage and wing panels at trailing edges.

Other small details are clearly shown on plan.

TESTING AND FLYING

Two types of propellers are used on this model. One, which has a wide blade, causes the motor to turn at less r.p.m. and greater flights result. The balsa scale propeller is used for exhibition purposes only. Six strands of ⅛ flat rubber are sufficient to fly the model. With the rubber motor and flying propeller in place, gently launch your model over tall grass.

By this method you can see if your model is properly balanced. If model glides a short distance, and nose rises abruptly, it will be necessary to add weight to bottom of nose block. If model dives, add weight to tail. After the model is balanced to glide on an even angle, you are ready to test your model under power. In making test flight, the principal thing to avoid is damage to your model.

Gliding and flying it over tall weeds is the safest, because the weeds or all grass break the fall gently in case the model should stall or dive.

A few trial flights will acquaint you with the ship, and all other adjustments can be made through the adjustable control surfaces.

This is an exact replica of the Curtiss-Wright Coupe originally developed for the Bureau of Air Commerce development program. It was this airplane that was built in an attempt to find an economical, strong all metal construction for private aircraft.

The Curtiss-Wright Coupe is entirely of metal construction similar to that applied to Lockheed, Douglas and Boeing airliners. This type of construction, Bureau of Air Commerce engineers believe, will be the answer to one phase of initial economy and ease of maintenance in the private airplane of the future.

In the original ship, controls were dual and of the wheel type. Comfortable seating arrangements were made for two persons and all-around visibility was brought out to a maximum.

This original airplane is now being used by federal aviation officials to test certain new controls and control surfaces. However, the ship is basically a conventional airplane powered by a Lambert engine. This ship is a sister of the other Bureau of Air Commerce project described elsewhere in this issue —the new roadable autogiro. Both are part of the government airplane development program.

This model should appeal to the lover of the most modern in aircraft design and construction because of its trim, well laid out lines.

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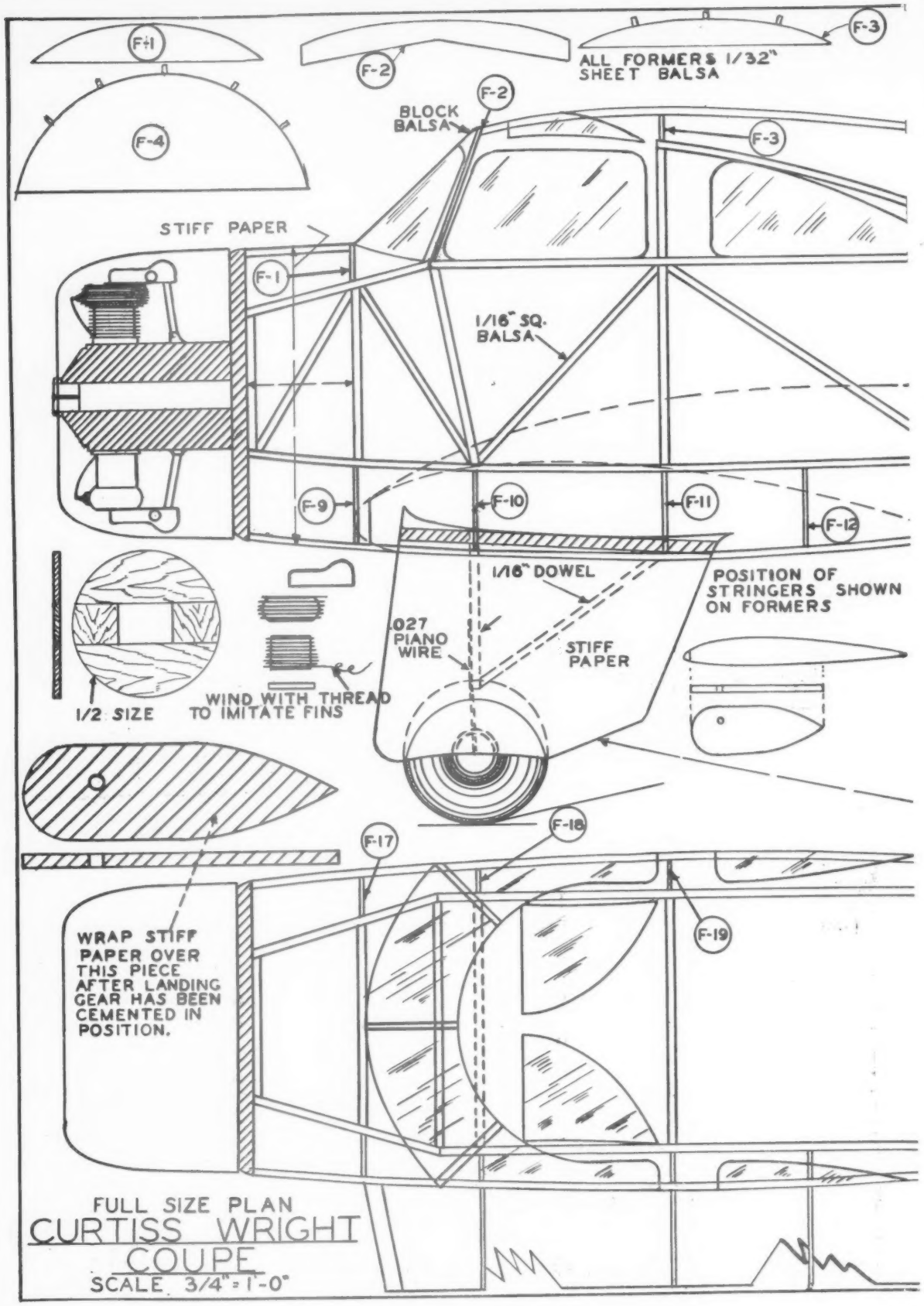
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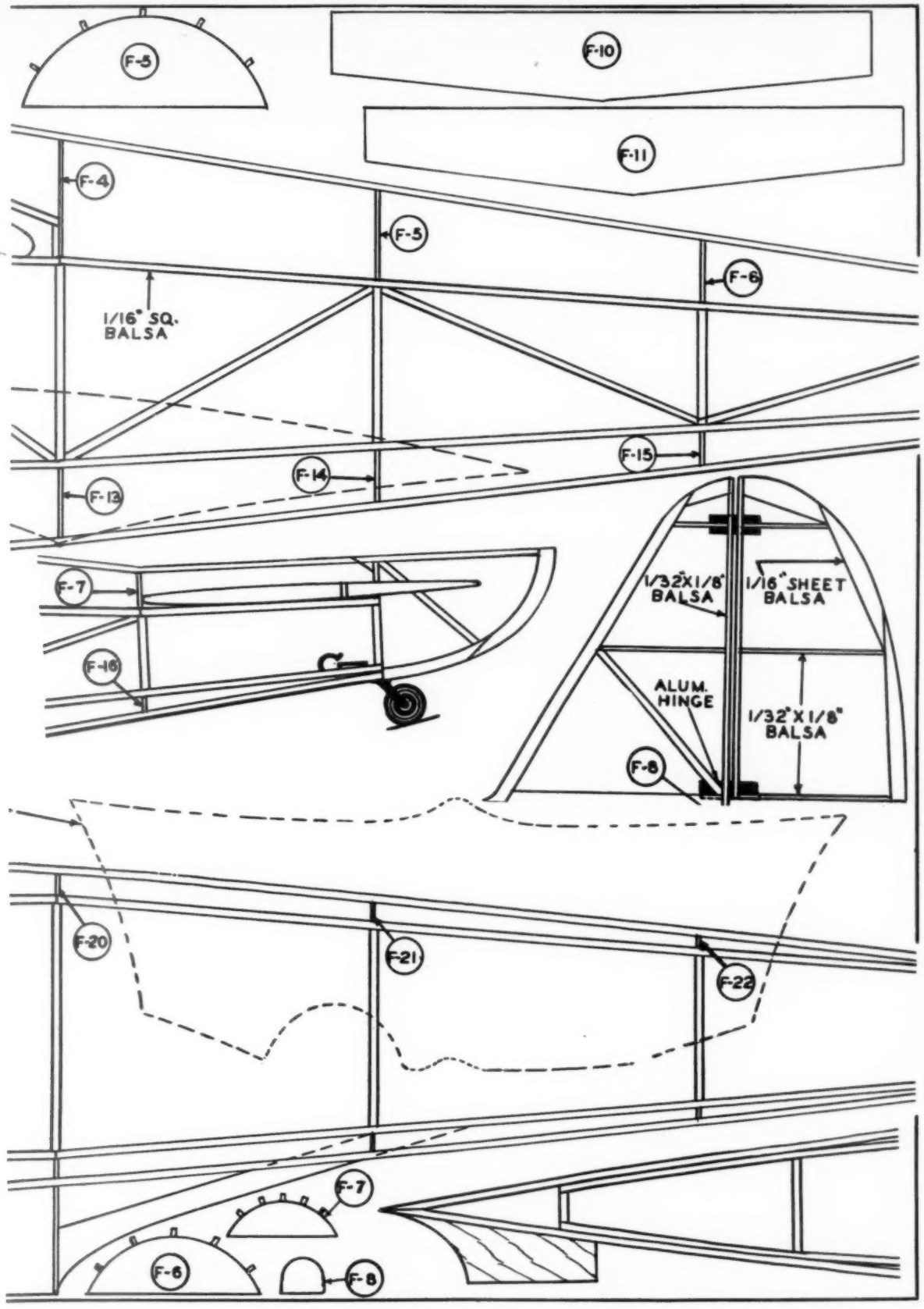
FULL SIZE PLAN
CURTISS WRIGHT COUPE
SCALE 3/4" = 1'-0"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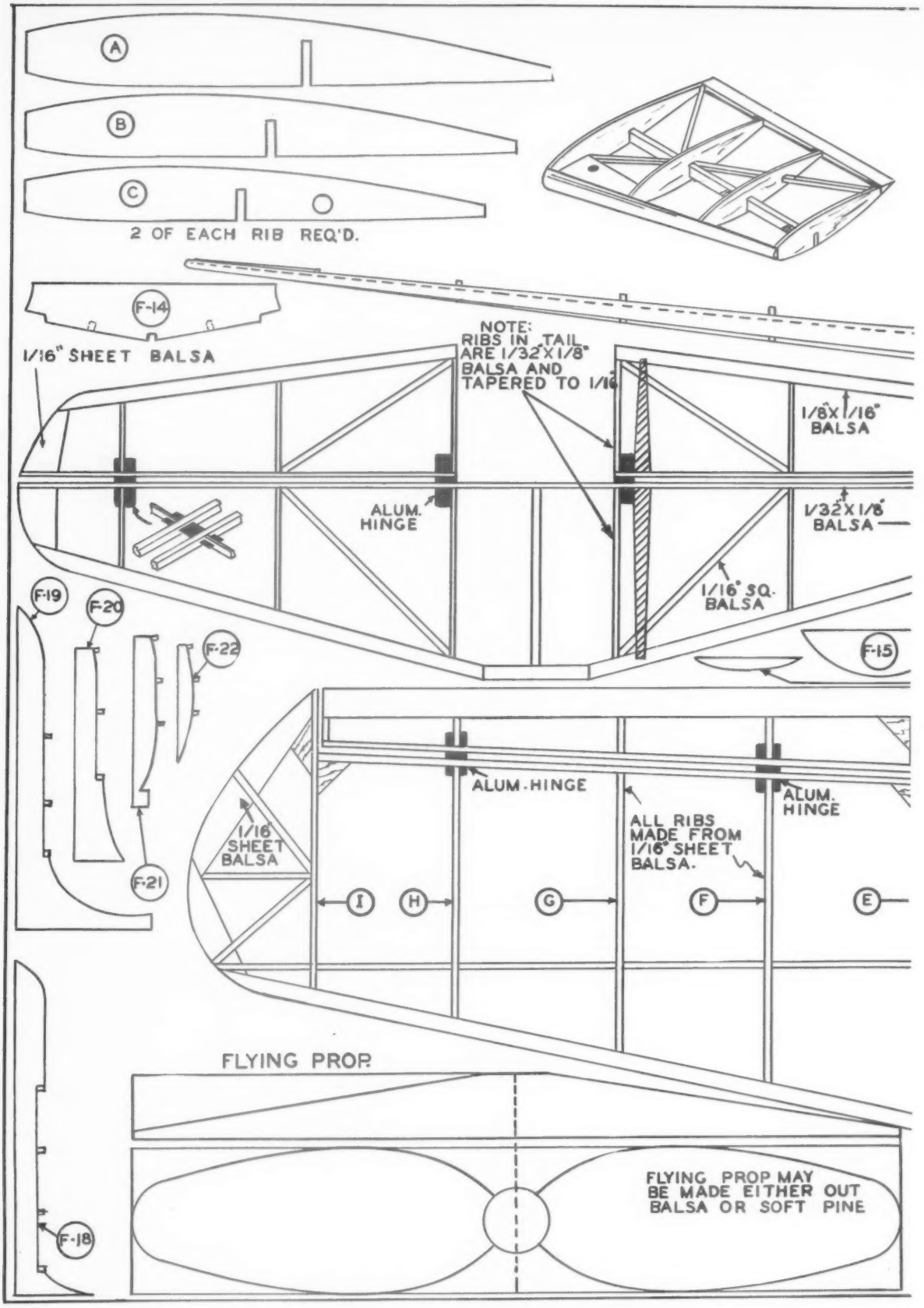
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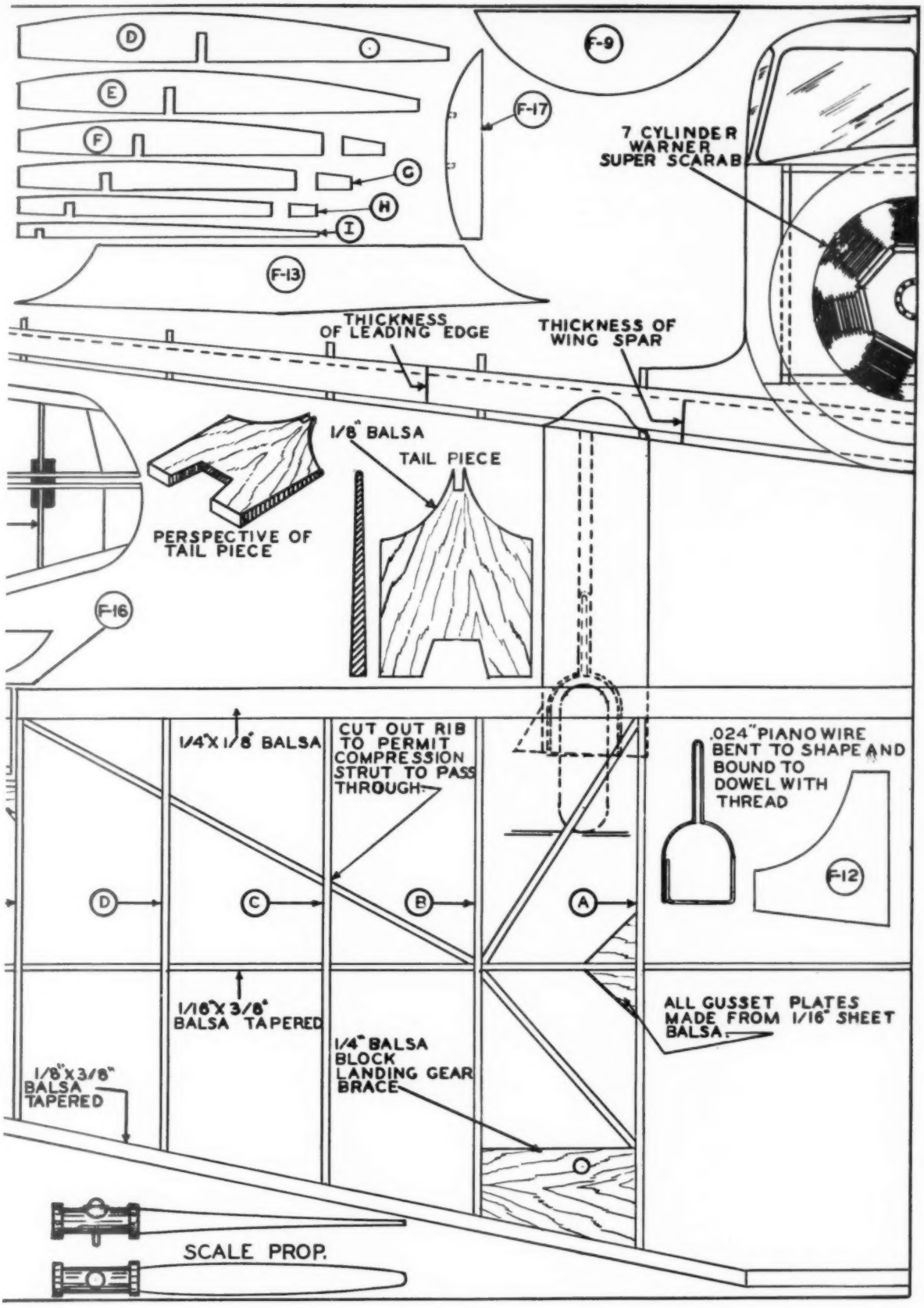
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BLOCK
LANDING GEAR
BRACE
1/8"X3/8"
BALSA
TAPERED
SCALE PROP.

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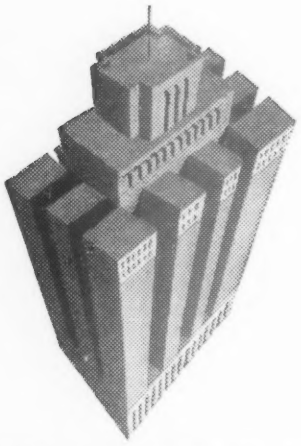

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STEVENS HOTEL CHICAGO

OTTO K. EITEL, Gen. Manager

December, 1936

(*Continued from page* 44)

While the world was agog at the Army's temerity, Dr. Alexander Graham Bell's tetrahedral kite made a towed flight with Lieut. Selfridge aboard. The 3393 wing cells lifted a gross of 600 pounds at some 21 mph. And a PORTABLE AIRSHIP MOORING MAST was described by Capt. Ferber in *l'Aerophile.*

1908. While Wilbur Wright was flying in France and Orville was demonstrating the Signal Corps machine in Washington, Dr. Bell's Aerial Experiment Association was completing its fourth machine to fly and on Dec. 6 J. A. D. McCurdy began a long series of flights with the *Silver Dart* at Hammondsport. A 50 hp. Curtiss engine drove a pusher screw by LEATHER BELT, geared down. Sixteen short straightaways were flown by M. B. Sellers in his quadruplane AIR FLIVVER. The 7 hp. engine, the pilot and the machine grossed 210 pounds. In the same month M. O. Anthony was demonstrating RADIO CONTROL OF AIRSHIPS. On Dec. 31 Wilbur Wright wound up a series of new records by winning the Michelin trophy and other prizes in a flight of 2:20:23 covering 124.7 kil., a feat of world astonishment when all other flights were being measured in minutes.

1909. WESTERN FEDERATION OF AERO CLUBS formed by Albert B. Lambert of St. Louis—another insurgent movement objecting to the control of national aeronautics by the Ae. C. A. Charles K. Hamilton launched his great airplane exhibition career with flights at St. Joseph, Mo. In Berlin a stock company was formed to control the Wright patent and manufacturing rights in Germany by Krupp, Borzig Mch. & Locomotive Wks., Hugo Stinnes, General Electric and others. All American eyes were on Los Angeles preparing for America's first air meet at which Paulhan made new world altitude record, with Curtiss, Willard, Hamilton, Hillery Beachey also present. Knabenshue and Lincoln Beachey sailed their airships.

1910. The Wright Co. sued the BELMONT PARK MEET corporation for payments alleged due under the meet license. Gross receipts were said to have been over $200,000—Cliff Henderson please note. In December the second L. A. meet. Participants were: Arch Hoxsey, C. F. Walsh, Cannon Boys, Edgar Smith, Glenn L. Martin, the only amateur who qualified; Hubert Latham, P. O. Parmalee, Chas. F. Willard, Eugene Ely, Walter Brookins Radley, Glenn Curtiss, Lincoln Beachey, Hugh Robinson. On the last day of the year Hoxsey was killed at L. A. while John Moisant, of Paris-London and Liberty Statue fame, was killed.

1911. Wright Company granted injunction against C. G. White, whose earnings in meets and exhibitions were considerable. FIRST AMERICAN AIR MOTION PICTURE taken by cameraman E. R. Shaw from Bob Fowler's transcontinental plane at Beaumont, Tex., on his way east. Camera geared to engine later flown by Phillips W. Page at Marblehead. A. E. Riggs claimed first American tractor.

1912. LONGEST WATER FLIGHT made by 'Tony Jannus (Benoist-100 Roberts), Omaha to New Orleans with mail and St. Louis beer; 1835 miles by route, 5 weeks with stops for passenger hops and exhibitions. At urging of Capt. W. I. Chambers, Navy air head, President Taft finally appointed commission to report on possibility of a national aerodynamic laboratory—now the NACA. The Navy had 8 pilots.

1913. NEW ARMY ALTITUDE RECORD by Lt. H. B. Post, 10,600 feet in a Curtiss. Power line inspection inaugurated by R. G. Fowler for Great Western Power Co. R. R. Grant continued flights with inherently stable tandem monoplane. Spencer Heath proposed and patented METAL PROPELLERS. Air force: Army 15 planes, Navy 10.

1914. ROUND WORLD PLANE RACE proposed by Panama-Pacific Exposition for $150,000 met with discouragement of industry in favor of a transcontinental, but neither run. Capt. T. F. Dodd and Lt. S. W. Fitzgerald won Mackay Trophy with Renault 70-Burgess.

1915. Packard Motor Car Co. announced its intention of developing an air engine. Secnavy Daniels ordered first Navy-built plane to be constructed at Washington. Lt. R. C. Saufley, USN, made NEW RECORD of 12,050 feet in Curtiss seaplane, at Pensacola. Collier Trophy won by W. Starling Burgess for development of the Burgess-Dunne inherently stable airplane.

1916. Annual Report of Postmaster General emphasized the purpose of the department to inaugurate AIR MAIL wherever possible. Advertisements for bids on routes in Alaska and Massachusetts failed of award. Sixteen planes in the Navy.

END

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Up Ship

(*Continued from page 16*)

When Jacob Klein speaks, he intends no pyrotechnics of the Billy Mitchell type.

Consequently, your correspondent believes, the Commander is worth listening to.

That night he spoke freely of the dirigible service between the United States and Europe. He spoke freely his thoughts on the difficulties attending lighter-than-air development in this country.

He is highly enthusiastic over the possibilties of the transatlantic service. It is an enthusiasm that you observe, not hear. He is not a vociferous man. He speaks calmly and evenly. He says we are only at the threshold of transoceanic travel and freight transport. But—

America is far from assuming the leadership her citizens have seized in so many other fields. It is development of our craft that is our most pressing need today. Anent the ill-starred Shenandoah, caught in a vast circular storm over Ohio and brought down with fantastic loss of life and equipment only eleven years ago, Commander Klein says:

"It is an illustration of what I mean. The Shenandoah was 'honestly' constructed. It was built under the supervision and with the best advice of Captain Heinen, a world expert. The Macon and Akron were built under the guidance of Dr. Eckener, Captain Ernst Lehman and Dr. Karl Arnstein, directors of the Goodyear Zeppelin corporation. But it was too big. Its development did not follow the departures even then being made from conventional dirigible design. Its size was not considered in relation to these facts.

"The Akron and Macon were each nearly four times the size of the 2,000,000 cubic foot Shenandoah. In departing too abruptly from established principles, the biggest mistake was made."

Germany, the Commander points out, was dirigible-minded, in a sense, long before the United States pooh-poohed the Wright brothers. During the Civil War, Count von Zeppelin served as an observer with the Union army. Such a struggle as was witnessed in this country between 1861 and 1865 had never been approached by the Napoleonic wars. The German Count had ample opportunity to see the greatest military operations of the century.

He took back to his Fatherland a vast fund of practical, as well as visionary ideas. He set to work on the construction of the type of craft that was to immortalize his name. Before the end of the century he had evolved masterpieces of aerial development.

As these thoughts on the subject of lighter-than-air distracted me from the arduous business of travelling a long distance, I glanced from the window and saw lights that told me we were rolling into the suburbs of our destination. Regretfully, I realized that our ride and our talk were about over. I knew there would be little opportunity for further questions. I wished that he had had time to answer some of my more trifling questions such as that about sea food and the one about whether he would like to be back in the service and the one about whether we should copy the Germans in making dirigibles.

But I had undershot my field. My friend had not forgotten these queries.

"And now," he said, "as for your other questions, I am extremely fond of sea food. I consider it a great delicacy but then if it is not readily available, the lack of it hardly perturbs me.

"A career in the Navy, once left, is something to look back upon. I have no plans for re-entering the service even though age permitted. I am satisfied with things as they are, even if I look over my shoulder now and then and give a sigh, just like anyone would who has been in it.

"As to copying the Germans, I think this: that it never does harm to acquire ideas from whatever source that has merit. I think you understand that I have every intention of praising the Germans, because their work in the dirigible field merits it. Indeed, I think we would do well to emulate them in some respects, and yet we have problems of our own that we must solve, too, hence we cannot adapt ourselves completely to their methods of doing things.

"And now, I trust, I have answered all the questions that have been agitating your mind since we first sat down here. Next time it will be my turn. I'll ask you a lot and learn all about reporting."

"I don't think you'll learn much," your correspondent parried, "but you'll be welcome to have a try. However, if I'm up to my usual form, I'll probably have a lot of new questions."

"I wouldn't doubt it at all. Not at all," the Commander returned, with a smile. "And now, let's get our bags together."

END

W. P. A.

(*Continued from page 43*)

eased by the offer of Works Progress Administration officials to cooperate with air-minded communities needing and wanting their own airports.

With the airlines contracting for huge four-engined airliners (Douglas already is filling a joint airline order) that will be in need of suitable landing fields to accommodate their size and scope of operations, it is only fair to warn "airline stop" communities that, if their municipal airports cannot meet the needs of these giant aerial liners of the very near future, the lines will move their bases of operations to suitable fields supplied by progressive and far-sighted communities.

Is your city one of the latter?

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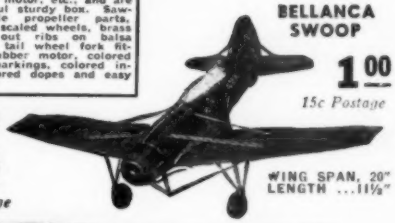

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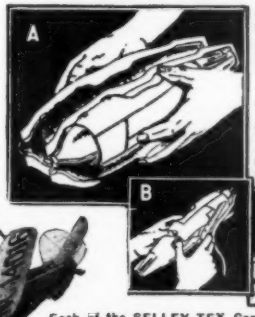

A—Fit together and cement the two moulded parts of the fuselage.
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WING SPAN, 20"
LENGTH .... 12½"

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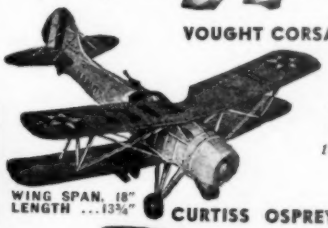

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CURTISS OSPREY

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The Uniplane

(*Continued from page 20*)

face gave visibility off to the sides and downwards. Straight ahead the visibility was poor for landing conditions, though fortunately depth perception and visual adjustment were not required other than for a sufficient knowledge that the landing area was clear, the Uniplane requiring no landing technique except for closing of the throttle, and trimming of the axes.

One of the more important features of the design, was the concave V bottom or dihedral which plays a role, in this case, of control agent as well as the customary stability agent. The belief from the outset was that airplane control would have to be simplified before the cost of flying could be adjusted to the general public's pocketbook. The low span of the Uniplane made it seem advisable and possible to do away with ailerons entirely, and use the principle which gives a V-bottom speed boat favorable banking moments in a turn or when yawed.

Thus, the Uniplane was considered a boat in air rather than water. Results have justified this highly experimental and even dangerous attempt to make flying more practical, the only period of control difficulty and resulting accident being during the trial of experimental ailerons which were added after continued warnings by experts against such a foolish idea as having no ailerons.

To be sure some trouble was experienced at first by a lag between rudder action and dihedral response which caused overcontrol. This was remedied by removing the entire original twin rudders and floating elevator, the latter being inadequate at high angles of attack, and trying a half-dozen types of rudders until a balanced rudder without stabilizer was found to give the desired control, the stabilizer being the cause of the lag.

Subsequently, flights in rough air showed an undesirable rolling trait which created a tendency to overcontrol, and also showed difficulty in making left turns against engine torque. A vertical stabilizer or dorsal fin over the center of gravity proved to remedy both problems. It is interesting to note that this arrangement is the same as on racing boats such as outboard racers which have a small hydro fin slightly forward of the center of the bottom.

To replace the floating elevator, the two trailing edge ailerons were hooked up to work together as elevator only, and have served the purpose well, having an extra stabilizing influence while the ship is landing in its customary pancake style, the diagonal, at which they are set, creating a dihedral effect when in the up position.

Flight tests consist of well over a hundred hops within the field, a dozen of which were made by a transport pilot, and eight flights outside of the field, six of which ended in forced landings. All flights other than the dozen made by the transport pilot, were made by a novice with one hour dual instruction on a Taylor Cub.

Further conventional instruction did not seem advisable because of the difference in control systems, and the danger of forming conflicting habits and responses, a premise which appeared correct when the transport pilot experienced difficulty in adapting himself to the feel of flying without rudder pedals to "kick" in emergencies. So, it is no doubt correct to assume that this two-control system will be easier to master by the new student than by the experienced pilot.

The two successful flights consisted of a four-mile hop around Harlem airport at an altitude of 100 feet, and an eight-mile flight at 250 feet in extremely rough air which the Uniplane does not like very well because of its too light wing loading. Of greater importance and significance than the successful flights, were the unsuccessful flights or the forced landings; for it was these that demonstrated the ability of the Uniplane to land almost anywhere an autogiro could be expected to safely set down, the landing rolls measuring from 200 feet down to three ships' lengths, though in every case the engine was kept open to its maximum dying revs. until just before ground contact.

A backyard, a cabbage patch with only one cabbage fatality, and the windward side of telephone wires were several of the spots at which flights were terminated. The average landing speed is estimated to be under 25 m.p.h.

The maximum angle of stall on the Uniplane appears to be around 40 degrees, an angle which it no doubt has achieved many times though there has been no tendency for it to fall off on one wing or start a spin. Even at such a high angle lateral control remains available, rudder action being sufficient to yaw the ship and set up the dihedral reaction.

END

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This new model, built very strong yet light in weight, is practically crashproof and will out-perform any large scale model built. Rises from ground in 10 feet and flies over 650 feet. Set contains all parts printed on balsa, ready cut pant cores, 4¼" turned motor front, 11" steel type carved paulownia wood propeller, 2½" balsa wheels, tail wheel, formed wire parts, 26' rubber, 3 oz. yellow dope, 2 oz. blue, ½ oz. black, 2 oz. glue, cement covering, full size scale drawing, and all parts **$4.95**
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Above photo shows finest equipped model of this plane on the market. Having ready made motor, cowl, prop, etc., it is very easy to build and is a beauty. Const. set contains 3" celluloid motor, 3¼" spun tapered aluminum cowl ring, 8" steel type paulownia wood prop, 1⅜" celluloid wheels, tail wheel, insignia, windshield, instrument board, 1 oz. yellow dope, 1 oz. blue, cement, glue, all parts printed on balsa, and drawing. **$2.75**
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New scale special detailed model, equipped with 2" pneumatic rubber tired M. & M. air wheels. Set also includes ready made and painted pilot's bust shown, 2 aluminum step plates, 9" carved steel type prop shown, all parts printed on balsa, turned balsa motor front, 3 oz. colored dopes, paper cement, 2 oz. glue, covering, colored insignia, formed wire parts, nose plug with brass bearing, rubber, 9 metal motor exhaust pipes shown on cowl, full size scale drawing, and all parts to build. **$3.75**
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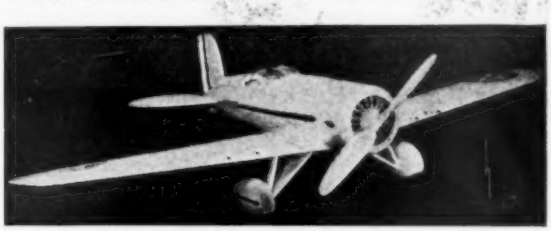

COMBINATION LAND AND SEA PLANE SET
32" Span. Length 20½". Weight 3½ oz. ¾" Scale

New 4-gun Navy fighter. Model will rise from land or water in few feet. Construction set contains fuselage and pontoon formers, wing ribs, tips, etc., printed on balsa, a 3⅜" turned cowl front, 2 instrument boards, colored insignia, lettering, windshields, 9" carved scale flying prop shown, 3 oz. silver paint, 1 oz. cement, ½ oz. black, 2 oz. glue, ready cut wheel pants, strong 2" aluminum wheels, 12 feet of rubber, and large 33"x44" drawing of land and sea plane. This is a sensational model and only one of its type in the world. **$2.95**
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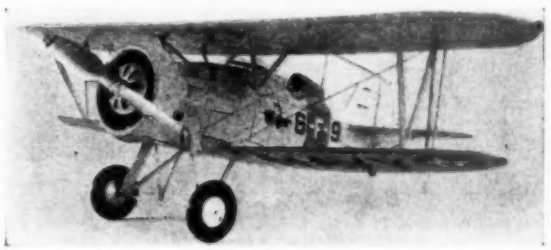

22½" Span. Length 14½". Weight 2½ oz. Color, Grey, etc.

This is the finest equipped Boeing, F4B4 model in the world. New improved model exclusively equipped with new 3¼" special aluminum streamline tapered cowl ring, 9 cylinder celluloid motor with aluminum ventilator front, 8" carved varnished steel type propeller, printed out balsa wood parts, 2 oz. grey dope, ½ oz. yellow, ½ oz. red, rapex cement, glue, formed wire parts, celluloid wheels, tail wheel, U. S. Navy lettering, colored insignia, and ¾" scale drawing. **Construction Set complete, postpaid** **$2.95**

NEW NORTHROP FT1 NAVY FIGHTER

22" Span. Length 15". Weight 2½ oz. ¾" Scale

A beautiful flying model of the latest Northrop 280 m.p.h. fighter. Set contains 3" turned motor front, 8" carved propeller, insignia, silver, black and clear dope, glue, all parts printed on balsa, full scale drawing, and all parts to build as shown. **$2.00**
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Airy Chat

(*Continued from page* 12)

meets is the fact that there are so few crashes and so little injury done to the gas motors when there is a crash. You know, that many of the wise guys predicted that the motor could withstand only a few flights and one crash, but this has proved to be entirely false.

* * *

JUST what causes a destructive fire right after an airplane crash is more or less of a mystery. Fires have consumed the ship when an examination of the wreckage shows that the ignition switch is in the "off" position and it is hardly possible that the exhaust manifolds are hot enough to ignite the gas.

Some time ago, a Chicago chemist demonstrated experimentally that the friction of perfectly dry gasoline in a tank generates a sufficient amount of electrical energy to cause a spark. Whether the swashing of the gas in the tank after the impact of the crash is sufficient to inflame the gas is an open question and the matter will prove a mystery until further investigations have been made into the chemistry of gasoline.

* * *

IT SEEMS strange, with thousands of square miles of open prairie land to choose from, that a radio broadcasting station should snuggle up as close as possible to an airport, endangering the planes with the masts and maze of wires, but it is being done right along in the Chicago district.

There are the towers of radio station WMAQ within a short distance of the Elmhurst airport, where several accidents have already occurred in the shadows of the towers, and then there is the more recent radio station WBBM that is within a stone's throw of another airport. Added to this are the high tension that hem the airports in on every side, the various telephone and telegraph pole-lines and the numerous trolley structures of the surface lines. That there are not more accidents due to all this mess of wires is a tribute to the judgment and care of the pilots.

* * *

WONDER how many Santa Claus stunts there will be in this country during the week preceding Christmas? Every year so far has seen Santa descending to the roofs of the various department stores via the 'chute, and every yuletide has witnessed at least ten Santa outfits scurrying perilously close to the aforesaid roofs in Jennies and every other sort of antique jillopy. All we lack is a load of sixteen Santas arriving in a Douglas passenger carrier or —mayhap, a bomber!

* * *

OVER in England, there is an association that collects old vehicles of every sort and conducts an exhibition of early autos, buggies and airplanes. Among the very interesting collection in their catalogue is a Bleriot Type II monoplane in good flying order. It would be fine if some group of men could get together and round up a lot of early American antiques, planes, balloons and dirigibles. Eddie Nelson got a good collection together for the 1933 Century of Progress exhibition and it is a pity that this group was not made into a permanent exhibition.

* * *

RIGHT here and now, while the spirit is upon me, I would like to start promoting the idea of a permanent aeronautical exhibition. Be it in Chicago, San Francisco or Dayton, Ohio, makes no difference as long as the old time planes are rescued from the hay-mows before it is too late. Every year sees one or more of these old relics destroyed and it will be only a short time before all of them disappear. I will be very glad to have you write in to me and give me your best ideas on such an exhibition.

* * *

THE Rosenwald Industrial Museum would appear to be the logical home of such a collection, but I am told that they have no appropriation for buying the specimens required, although the officials appear to be greatly interested in such a project. We'll see how this thing develops and how our readers respond to the movement before I go to work seriously with the idea.

* * *

OUR idea of the upper limit of something is the prices of aeronautical cameras. The prices for an airplane camera start in where the prices of ordinary high grade still cameras leave off.

There is apparently no reason why such high prices should prevail, for the airplane camera is not overwhelmingly more complicated or perfect than a high grade still instrument. If the lid were off on aero cameras, we believe that many pilots would purchase them for pleasure and for profitable commercial photography.

* * *

Once more Airy Chat finishes slap up against the ads and if I have good luck it will happen again next month. Cheerio! J.B.R.

COLT 45 Cal. AUTOMATIC $1.00

Colt 45 Automatic pistol model kit $1.00

Thompson Sub Machine Gun (half scale) Construction kit with machined barrel, magazine, necessary hardware, and working plans..... $1.00
Thompson Sub Machine Gun (full scale) kit.... 3.00
Savage cal. 32 automatic, machined barrel..... .75
Luger 9 M/M auto, with 4" machined barrel..... 1.75
Colt single action Frontier revolver..... 1.45
Send postpaid in U. S. A. No stamps please. Checks 15c extra.

● FREE! ●

25 cal. Colt Automatic regular 50c kit free with every order of $2.00 or more.

These beautiful kits are complete in every detail, made of the best basswood. All parts are cut to shape and require only a short time to finish.

GUN MODEL CO., 2908 N. Nordica. Dept. K12, CHICAGO

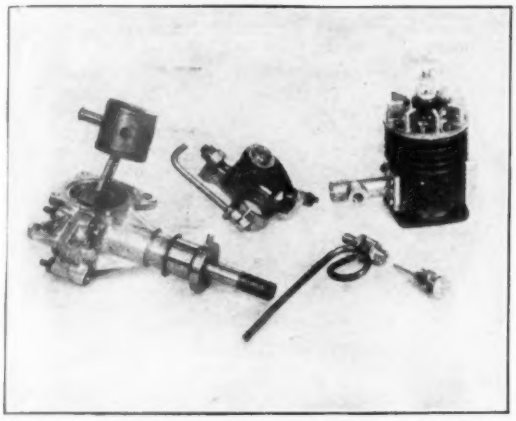
New "OUTBOARD" Motor Sled READY For Home Builders!

Now you can easily build Mead's new, streamlined MOTOR SLED at home from drawings, parts or complete Construction Kit! Uses OUTBOARD or other engine. Low cost. Amazing speed. Seats 2. Also Ice-Boats, Ki-Yaks, Sailboats. Rush 10c for illustrated literature. MEAD GLIDERS, 15 S Market, Dept. 12-E, CHICAGO

XUM

G.H.Q. GAS KITS

Continued up to Xmas - by overwhelming demand!



Well—we're quite frank to say that we just couldn't discontinue the sale of G. H. Q. Gas Kits. So overwhelming was the response to our announcement of last month—so anxious are additional thousands of men and boys to obtain Gas Kits that we are extending our offer up to Christmas only—positively not beyond that date.

Only six months ago, G. H. Q. blazed new trails in model airplane history with the news that a super-power engine may be had at $8.50 for a limited time only. Thousands of delighted men and boys availed themselves of this unusual opportunity since that time. We have decided therefore that we are now at liberty to withdraw this temporary offer and discontinue the delivery of all G. H. Q. gas motor kits after Christmas—selling finished motors only thereafter.

Here is your last chance to obtain the G. H. Q. Motor Kit, an engineering triumph—accomplished only after years of scientific aero-dynamic research. Thousands of letters have poured in from all parts of the country praising and recommending this mechanical achievement and the thrill of a lifetime will be yours with this motor kit—one of the most powerful ever constructed. Has broken records for amazing performance—flies model planes up to 10 ft. wingspread. Also used for boats and stationary use. Easy to start and simple as ABC to assemble.

Everything is in the kit including plug, coil, condenser, tank, ignition wire, cylinder, piston, connecting rod, timer, crankshaft, all screws, nuts, bolts, etc. No oil, gas, batteries, or propeller included.

Postpaid for only.....

$8.50

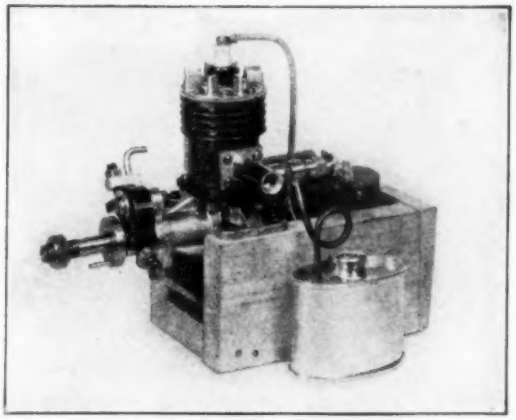
AND THESE FEATURES MAKE THE G.H.Q. GAS MOTOR A WINNER!

1. Steady running—as long as gas, oil and spark are supplied.
2. Motor cannot overheat.
3. Precision parts.
4. All parts replaceable.
5. Cylinder and piston lapped.
6. Accurate die castings.
7. Crank shaft balanced and perfectly machined.
8. A light spark coil that is oil, water and gas proof.
9. Coil will not overheat or shortcircuit.
10. Main bearing is high-speed bronze, ground and lapped to size.
11. Condenser is gas, oil and water proof.
12. Cylinder and piston inspected cast iron to insure long life.
13. Chrome nickel steel shaft with 1¼" bearing surface.
14. Connecting rod of high speed bronze.
15. Carburetor assembly accurately designed and made.
16. Needle valve and valve body machined together.
17. Breaker assembly compact, fool-proof, long wearing, replaceable and adjustable.
18. Easily inverted and runs in either direction.
19. Motor starts and runs on 2-ounce battery.
20. Speed range 500 to 10,000 R.P.M.
21. Low gas consumption—runs 27 minutes on one ounce of gas.
22. Strongest mininture motor.
23. LOWEST PRICE EVER SET.

READY-TO-RUN G.H.Q. GAS MOTOR

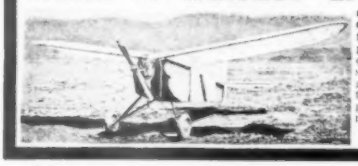
The famous motor complete, entirely assembled on stand. Tested and run before shipment—Performance guaranteed —1/5 horsepower at 3000 to 7000 R.P.M.—No oil, gas or batteries included. Postpaid for only.....

$12.50



FREE 1 finished fly wheel mounted on motor with every finished motor. This offer not for dealers.

HERE IS NEWEST G. H. Q. SENSATION!



G. H. Q Sportster kit specially designed for G. H. Q. Gasoline motor but may be used for any other motor of like weight and power. Built according to scientific aero-dynamic principles—Has made hundreds of successful flights without crackup—Marvelous glider . . . And what a climber, 4 hour flights are common! A complete kit of all parts including plan, all wood, wire, wheels, metal and other parts. Postpaid for only

$5.00

"IT'S WORTH TWICE AS MUCH"

Sept. 4, 1936.

G. H. Q. Model Airplane Co.,
564 Southern Blvd., New York, N. Y.

Dear Sir:

I just want to tell you how satisfied I am with my G. H. Q. gas motor. It runs perfectly and starts very easily. I don't know how you can sell it so cheaply—I think it's worth twice as much.

Very truly, GEORGE RAMASEK.

Send 3c for illustrated catalog of gasoline motors, gasoline planes, gasoline accessories and parts

We have a complete line of kits from 10c to $1.00

A GUARANTEE

G. H. Q. machinists have successfully constructed hundreds of finished motors from the kits without having had any motors which did not operate satisfactorily. Should any purchaser be unable to assemble a working motor he may return parts to us with $4.50 (charge for assembling and postage) plus cost of any damaged and missing part. Finished motor will be shipped in a few days.

G. H. Q. MODEL AIRPLANE CO., 854 East 149th St. New York, N. Y.

My Hero

(*Continued from page 26*)

white folds and not once did she fail me—bless her.

It was windy as blazes up there and now, as I floated lower and lower, I made the horrifying discovery that I was heading right for the middle of that cold green strip of water a few hundred feet below and there was nothing I could do about it. I had been told how to "slip" a 'chute and, though I yanked at the wheel, pulled everything else and cussed like a mule skinner, it mattered not one whit. I might as well have been enjoying the scenery while I could.

Four hundred feet, and I was now directly above the river. I was in still air now and moving but little. I hung there in the silence like the pendulum on a run-down grandfather clock, and down below a short, stocky figure in greasy white coveralls stood gazing anxiously upward. I floated lower and lower.

I had one awful feeling of a green hand coming up to clutch me in wet fingers and then I hit the water about ten feet from the bank. There was a splash, a spluttering yell and I went into six feet of water with the thirty-four foot spread of the 'chute settling squarely over the top of my head.

Then, my hero, Mr. Appel, entered onto the scene with a bang. Or, rather, he entered *in* the scene with a splash. He came plowing down the field like a small express train, left the bank in a flying dive and came up waist deep and began yanking the folds of the 'chute off my head.

He got them off and dragged them up the bank, and inasmuch as I happened to be fastened to the other end of the 'chute I came along too.

Looking like two half drowned poodles we scrambled to the top. "Are you hurt, Tex? Are you all right?" asked my rescuer anxiously.

"My boots!" I wailed.

"Boots?" Mr. Appel looked blank.

"My new boots!" I howled dismally. "They're all full of water!"

The effect upon the rescuing hero was startling. He uttered a seal-like squawk and gave me a violent push in the chest. I let out a yelp and went over backwards down the bank and into the water again.

The first thing I saw when I spluttered to the surface was a belligerent figure in sopping wet white coveralls glaring disgustedly down from the bank a few feet above.

"There, blast you!" snorted my hero, shaking a chunky fist. "I hope you drown!"

Nozzir, Web, you never would make a good movie hero and thrill high school girls with daring rescues. You just ain't got enough damn manners a-tall!

END

Veterans

(*Continued from page 22*)

blimps and sausages. Most of America's observation balloons were made in Akron with Goodyear constructing 1800 all told, many of which were shipped overseas.

During their stay in Cleveland, many of the balloon boys visited the old Wingfoot Lake base in Akron and rode in the modern Goodyear blimps, recalling old training days.

Balloonists were trained and sent overseas as fast as possible.

In direct communication with artillery batteries, and regimental posts of command, these awkward-appearing bags gave to the army its most important method of artillery regulation. The observers were equipped with powerful binoculars and coordinated maps, and from their lofty vantage points they could direct artillery fire on enemy concentrations which they had previously spotted. Many times their observations changed an entire plan of attack.

In each balloon company, 100 men were needed for ground duty to make possible the observations of the pair in the air. Most of the men in the organization rotated from ground service to observation service—they were at times, riggers, telephone and gas men, mechanics or machine gunners—all playing an important part in this drama of balloon warfare.

That they are preserving their traditions, and keeping tryst each year at the Legion conventions is a commendable thing. Their meeting was one of the most colorful of the whole great mardi gras of the Cleveland celebration.

END

GAS KITS MOTORS SUPPLIES

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Gives This Sensational Performance

Flies 20 M.P.H. Over 30 minutes on ½ oz. gas (capacity 1oz.). Takes off in 25 feet. Lands at 16 M.P.H. Full Size Plans.

Full size plans, ready cut out ribs, Latest Type M. & M. air wheels, aluminum motor mount, sheet aluminum for cowling, special metal fittings, veneer, all balsa parts cut to correct size, tubing, rods, springs for shock absorbing landing gear and clear and colored dopes. This fine kit is complete down to special bolts, screws and many other parts too numerous to mention here.

Span OVER 6 FT.
Length OVER 3½ FT.

The Baby Cyclone or any light model engine can be installed in this Rearwin Model.

HIGH QUALITY and REAL VALUE. COMPLETE KIT only $7.00

COMPLETE KIT INCLUDING BABY CYCLONE MOTOR $22.75

Add 50c extra to cover cost of packing and mailing.

(West of Mississippi add 10%; Canada, 10%; Foreign, 15%.)

If you desire we will send an engraved Xmas Card with each order.

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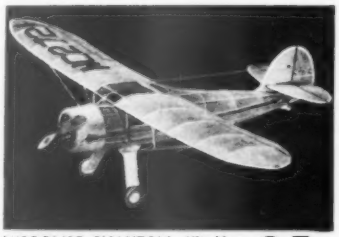
Save money developing, printing your own pictures! No experience needed. Send only $1.49 for professional outfit including electric ruby lamp, developing and fixing trays, chemical, photograph paper, complete directions. Or pay postman $1.55. A $2.65 value. Satisfaction or money refunded. Write for FREE BARGAIN BOOK of cameras and supplies. CENTRAL CAMERA CO., Est. 1899, 230 S. Wabash, Dept. PA-12, Chicago.

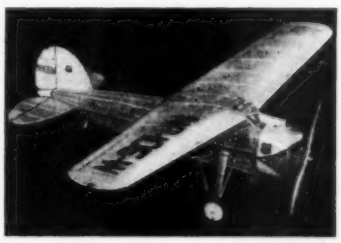
Santa makes a 3 POINT LANDING in a COMET

Shock-absorbing landing gear MODEL!

Yes sir! This Christmas, the chances are that Santa will alight gently and smoothly in a COMET Exact-Scale Model, with actual working shock-absorbing landing gears and tailskids. Three of these sensational new models are shown directly below—see the big new COMET catalog for others, as well as many new kits in every price range! Make Christmas complete with one or more COMET Exact-Scale Models, or the marvelous new COMET Solids, with their revolutionary construction method! Send 3c stamp for big 16 page catalog today—and see the new COMET kits at your nearest Comet dealer.



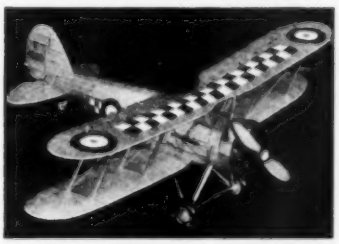
LUSCOMBE PHANTOM—Kit No. 2A-164, 25" wingspan..... **25c**



WINNIE MAE—Kit No. 10A-133, 36" Wingspan..... **$1.00**

WACO S-6—Kit No. 5A-177. Wingspan 33"..... **50c**

CHINA CLIPPER—Kit No. 2S-169, 12" wingspan—Solid **25c**
Other Solids: 8"..... 10c; 12"..... 25c



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BOAT MODELS, TOO!

A great new line of modern and historical boats; New simple construction. 8" long, 10c. 12" long, 25c. See catalog for others.

25c R. M. S. Queen Mary Kit No. 2B-13
10c Size Kit No. 1B-12

SEND 3c for BIG NEW 16 PAGE CATALOG!
—showing 100 different airplane and boat models. Interesting notes on each model.
SEE COMET KITS AT YOUR LOCAL DEALERS

U. S. ARMY CONSOLIDATED BT-7—Kit No. 5A-178. Wingspan 31½" **50c**

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Lightplanes

(*Continued from page* 40)

we have seen them sell them for even much less. We have seen the amateur builder offer parts for the light planes at much less than it would be possible for anyone to manufacture them and make any profit.

The answer to our problem is to figure, and count everything. Then when we sell a product, sell it for what it is worth.

Let's consider a rib for instance. We have often seen them advertised by the home-builder at around fifty cents a rib and less. Recently, I had a number of ribs built up for me for a light single-seater I am building. The chord of the rib was only 3½ ft. The cost ran as follows, and I am very sure that no one else can produce a good rib for much less.

(Prices quoted from standard aviation catalog)

14 ft. capstrip @ 3c per ft.	$0.42
¾ sq. ft. plywood @ 20c	.15
Casein glue @ 60c per lb.	.01
Brass nails @ $1.14 per lb.	.02
Labor (for 1 hr. 10 min.) @ 75c per hr.	.83
Total	$1.43
Add 50% to protect your commercial rights	.72
Final Total, per rib	$2.15

Now please remember that if you gave your sales agent the ordinary and fair commission of 33⅓% you would have not a cent of profit left for yourself.

But you say, my time isn't worth 75c per hr., and anyway I made it on the side so I don't need to count my time. My friend, do you mean that you have a right to crowd or chisel out the fellow who is trying to make a living with his products simply because your time isn't worth anything on the side?

Don't you realize that your fellow man in business cannot make a living on the side and continue to produce? The sooner you and I give these things a little thought, just that much sooner may we expect to receive and hold our rightful privileges to build and fly our own aircraft unrestricted in the private non-commercial field.

The next time you build a plane, keep a faithful record of the time you put into it, the cost of material at market price. (Not bargain price.) Every little detail must be kept on this record, and in the end figure your time at the rate paid for regular aircraft mechanics, and see what your honest and fair price on your plane or its parts will be.

Then hold it to its value. The next time you young pilots think you can fly a little cheaper than the fellow over at the airport, think it over, the cost of mechanics, parts, everything, then hold up your price or get out.

Aviation has no place for chiselers, whether they be in the commercial field or the amateur. While I know that a lot of you fellows have never given this thing a thought, yet I am sure if you will do it you will agree with me, and you will find the general public looking a lot more favorably on your home built craft, and the big fellows will be a lot more friendly to us.

I'm an amateur myself, but I am sure of what I say. Think it over, do a little figuring and I am sure you'll find yourself in step with the game. Come, let's play ball.

END

BUY NOTHING

till you get this great 64-page catalog that saves you time, money and trouble on your purchases.

Featuring Gas Engines, Kits, Supplies, etc.

BIGGEST catalog ever offered modelbuilders and home craftsmen. Greatest array of gas engines and supplies ever gathered in one book; Gas airplane kits. Over 100 authentic C-D flying model airplanes; solid model airplanes. Largest assortment of small hard-to-get electric motors in the U. S. All kinds of inexpensive hand tools, micrometers, etc.; tiny electric equipment for modeling purposes. Ship Kits and supplies. All kinds of new modelmakers' cements and liquids (including finest Bakelite model varnishes yet developed). Laminated gas model props; largest assortment of cut balsa props ever assembled, and hundreds of other items you need. This book brings you the newest and latest—no modelbuilder can be up-to-the-minute without it. Thousands are already sold. Don't miss getting a copy. **Rush 10c today for yours!** No free copies.

(OUR 5¢, C-D model airplane catalog discontinued.)

DEALERS: Brand new proposition! Just in time to catch Christmas demand. Bigger discounts—reduced prices. Wire or write at once!

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The major aeronautical event of the year —in the richest air market in America!

NATIONAL AVIATION SHOW

GRAND CENTRAL PALACE

NEW YORK CITY

JAN. 28th to FEB. 6th, 1937

PROGRESSIVE concerns in the industry have already reserved exhibition space. Applications for space, representing every division of aeronautics, are now being received. We suggest that you plan now to be represented in this important sales project which is sanctioned by the Aeronautical Chamber of Commerce and sponsored by Aviators' Post No. 743, The American Legion

Write or wire immediately for details to:

NATIONAL AVIATION SHOW

G. A. PARSONS, Managing Director

NATIONAL AVIATION SHOW

Grand Central Palace, NEW YORK CITY

JAN. 28th to FEB. 6th, 1937

This is the INDUSTRY'S BIG EVENT!

WILLIAM CHALKLEY writes:

"When I invested my money in a course at Roosevelt Aviation School, I automatically insured my future."

William Chalkley, Master Mechanics graduate is now employed by Sikorsky Aircraft. His case is not unusual. Some other Roosevelt graduates are now employed as follows:

BAYARD BOHNER, Commercial Pilot and Mechanics graduate, with Pratt & Whitney.

LOUIS LANGHAUSER, Master Mechanics graduate, with Aero Trades.

SAMUEL DE NARDO, Elementary Mechanics graduate, with Fairchild.

MICHAEL GOLDENBERG, Elementary Mechanics graduate, with Seversky.

LOUIS SCHWICKER, Master Mechanics graduate, with Engine Air Service.

JOHN FALLON, Master Mechanics graduate, with Grumman.

MICHAEL BOYHAN, Master Mechanics graduate, with Waco Sales.

THEODORE BESCHER, Master Mechanics graduate, with Pratt & Whitney.

JOHN KOWALCHUK, Master Mechanics graduate, with Sikorsky.

GEORGE HUDSON, Elementary Mechanics graduate, with Engine Air Service.

DAVID SMITH, Master Mechanics graduate, with American Airlines.

MURRAY MEYERS, Master Mechanics graduate, with American Airlines.

VIC KROFF, Transport Pilot graduate, is now District Traffic Manager of San Francisco for Pan American Airways.

HERBERT PEARLMUTTER, GERALD HURWITZ and **HERBERT WEINBERGER,** all Master Mechanics graduates, with Douglas Aircraft, and **JOHN DIBBERN,** Master Mechanics graduate, has opened an engine repair shop on Roosevelt Field.

You have the same opportunity to go forward in the fastest growing, most fascinating business in the world. *But it is important that you choose the right school.* Your future, in large degree, will depend on that. Roosevelt, with ten years of experience, has an established reputation for leadership. Equipment, location, instructors—the whole set-up—is right and every step is designed to teach you efficiently and thoroughly the course you choose and to fit you for a position wherein your future is insured in exact proportion to your individual ability to make good and assume larger responsibilities.

Mail the coupon today. Get our new, beautiful, profusely illustrated catalog and Outline of Courses which tell the story in detail and will reveal to you, as nothing else can, the amazing possibilities that lie ahead for ambitious people in aviation, where, literally, *the sky is the limit.*

Don't delay. Many were disappointed because Fall Classes were filled to capacity while they hesitated.

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P. A. December, 1936

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Wright Brothers

(*Continued from page* 18)

of the famous brothers. Wilbur was born in April, 1867, in a farmhouse near Millville, Ind., and Orville was born four years later, after the family had removed to Dayton.

Two other brothers took little active part in the experiments of Wilbur and Orville. One brother, Reuchlin, moved with his family to Kansas City. Lorin, the other brother, still lives in Dayton. Their only sister, Katherine, now dead, was a teacher. She turned over to her brothers what funds she could spare from her income, teaching Latin and Greek. She aided them with advice as well as money, and joined them on a visit to Europe after their early recognition.

Young Russell, Orville's protege, is a grandson of Reuchlin Wright. Mrs. Russell, his mother, explains that the young man at first was not much interested in aviation, but has become more and more so, and on leaving college probably will engage in aviation research. Perhaps the older man's interest is explained, in part, by the fact that neither he nor Wilbur married.

At Russell's age neither of the Wrights had become actively interested in flight, for Wilbur was 29 and Orville 25 before they returned to a sport that had entranced them in boyhood.

Lilienthal carried gliding to the point of a fine art, and had made about 2000 flights before he crashed in a tricky wind one day when trying out a new control system. With his death, highly developed plans for powered flight went into the discard.

The parallel between the Lilienthals and the Wrights is a striking one. In each case there were two brothers, Otto and Gustav Lilienthal, and Wilbur and Orville Wright. Each team started with the pedaling principle: the Wrights with their bicycle shop and the Lilienthals with a flapping-wing device, operated by pedals, with a counter-weight, for determining the power an operator might generate.

The parallel has a tragic and anti-climatic side, too, for in each case the death of one brother brought an end to the dazzling achievement of the team. When Otto died, Gustav Lilienthal, never an ardent flight fan, retired completely from gliding. But the torch was flung clear across the Atlantic, in the form of a brief newspaper notice of Otto's death.

This occurred 23 years after the boyhood thrill of the Wrights with their father's helicopter. The intervening span covered a variety of interests. From building helicopters "bigger and worse," the brothers returned to kite flying, a sport they abandoned with the new interests of high school.

Lorin and Reuchlin, their brothers, went to college; so did Katherine, but neither Wilbur nor Orville went beyond high school. Wilbur rejected the chance to go to Yale. When Orville used homemade tools to make a crude woodcut, his father bought him a book on the subject and his brothers presented him with a set of engraving tools.

Then he and Wilbur built a printing press with parts from scrap heaps of Dayton printeries. A discarded tombstone served as flatbed. The product, a four-page weekly, was not a success, and a neighborhood daily paper, "The West Side Evening Item," saw its last issue after four months.

Following this brief venture into publishing, the brothers found another outlet for their inventive and mechanical genius—building bicycles. Bicycles were popular, and it was no uncommon thing for newspapers of the day to feature activities of cycling clubs ahead of international news. Then came the Lilienthal dispatch, and the Wrights turned from bicycles to gliders.

But today there live on Dayton's west side four business men who knew the Wrights when they still had their bicycle shop and who recall the first struggles. They are Irvin Fouts, Frank Hamburger, William Tompert and William Orth, all engaged, with the exception of Tompert, in business in approximately the same locations. These men speak of the Wrights as "kindly men unafraid of work, with the mettle of successful men, but unchanging toward old friends even after success."

For 40 years Hamburger has been in the hardware business, and his store now is only a few doors from the bicycle shop. But 33 years ago his store was directly across the street from it.

"I frequently visited the boys in their shop," he recalls, "and watched them work on the parts that went into their first successful ship. I furnished some of the hardware they needed on the engine and other parts."

The Wrights were not at all secretive about what they were doing, Hamburger says. They talked freely with friends and neighbors and went ahead with their work, undisturbed by those who dropped in for a friendly chat or to transact bicycle business.

Hamburger also recalls the part he had in Wilbur's success abroad, in trial flights: "When he took the plane abroad," he says, "he found the stove bolts he had taken for assembling the plane were too short. He could not find what he wanted in France, for the French apparently were not makers or users of stove bolts."

Wilbur knew one place where he could get what he wanted, and ordered them from Hamburger. He shipped them.

Another friend, Fouts, is reminded of the early days of the Wrights as a youth, rather than a contemporary business man. He knew them when they operated a commercial printery in another location.

"We kids used to go to the rear of the bicycle shop and see the Wrights at work in the back room," he says. "I recall what a thrill it gave me when I saw their motor really running."

Tompert, who was in the meat business, knew not only the inventors but their father. "Many times," he says, "I saw the Wrights engaged in making parts for their plane in their little workshop near my place of business. I visited them often."

He recalls that the brothers had a repairman and mechanic in their bicycle shop, one Charles Taylor, and as they became more engrossed in the plane they took Taylor away from bicycle work and put him to work on the plane.

"The boys worked a great deal at night," according to Tompert, "but apparently not because they had anything to conceal. They were tireless workers who kept steadily at their task, and right well do I recall the grimy appearance they presented when at work with their tools in the rear room."

Orth, who still operates the cafe he had 33 years ago, had occasion to drop in on the Wright brothers in their shop at least once a week.

"I remember," he says, "that the boys after taking the storeroom erected a balcony across the west side of the front room, and this, reached by a flight of steps, provided office space from which the brothers could see a customer enter."

Orth says he was one of the few, in those days of skepticism, who "gave

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them the benefit of the doubt. I have in mind one experience with the boys, when they were experimenting with a hydroplane. I took the first ride with them in the thing when they launched it on the Miami river near the Third St. bridge. It would float all right, but it wouldn't leave the water. Even then I would have invested $1,000 with the boys, but they never asked me for it."

One of the Wright neighbors who had unlimited faith—perhaps because he was so young, and it is the youth who are the hope of the race because they are so hopeful—one was Walter R. Brookins, who lived right next to the Wright brothers on Hawthorne St., where Orville and Katherine were born.

"All during my grade and high school days," wrote this Early Bird, who was to be among the most successful Wright pupils, "my boyish enthusiasm and interest were so great that I was allowed to watch their experiments and listen to many of their discussions about gliders and planes.

"Although it seemed like a dream impossible of fulfillment, because I had so much enthusiasm and apparent grasp of their theories they promised me an opportunity to fly when they had perfected the aeroplane. They kept their word and I was the first one to be given the opportunity to demonstrate it to the public."

After the first flights at Kitty Hawk, young Brookins attended high school. But he divided his spare time between watching the Wright brothers and tinkering with engines. As he neared 20, he had his father ask the Wrights to give him the promised chance. They did, and Brookins flew at the Wright school at Montgomery, Ala., where the army now has Maxwell Field, for a total of two hours and 40 minutes. Then Orville returned to Dayton, leaving the young man in charge.

With the death of Wilbur on Memorial Day, 1912, Orville seems to have retired from the vigorous pursuit of aviation.

Although Dayton loses the shop in which the Wrights made their epochal plane and its predecessors, the gliders, it retains many landmarks and other mementoes of its most famous sons.

Most notable is the Wright homestead, on Hawthorne St., where Orville and Katherine were born and where Wilbur died; the old hangar on the Huffman prairie, where the Wrights made most of their "follow-up" flights, and a number of smaller souvenirs.

Of these latter, one recently was restored after having been for years in the possession of Hamburger, the veteran hardwareman. This is a model of the first military airplane, the craft wrecked at Fort Myer, Va., in 1908, when Lieut. Frank Selfridge was killed and Orville was injured badly. From the wreckage Wright salvaged some material which he gave, together with the specifications, to a nephew, Milton Wright, son of Lorin, and to Charles Taylor, son of the Taylor who was their mechanic in the early days.

Hamburger kept the model for many years, but gradually it became broken. Recently he gave it to Roosevelt high school, and there the industrial arts students repaired it and installed a tiny motor. It hangs near the ceiling of the industrial arts department.

END.

Landing-Gear

(Continued from page 40)

But this dissipation is not sufficient for smooth taxying; shock struts were constructed creating an evenly high resistance forcing fluid through a small orifice during the down stroke and forcing fluid through a large orifice (valve) during the return stroke. The work diagram for a hydraulic shock strut is shown in Fig. 5, indicating a high amount of dissipation of energy.

The hydraulic shock units changed the old style landing by avoiding the "floating" altogether and with a typical modern airplane a direct stalled descent may be accomplished without rebound or breakage, and with a ground angle less than the stalling angle.

In conclusion we will mention that the longer the travel the higher sinking speed can be used, and it would not be impossible to design shock units to dissipate head-on landings without discomfort to the passengers.

END

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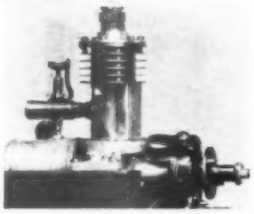

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XUM

Air Board

(*Continued from page* 34)

couraged as much as possible. Certainly it would be desirable to have worthwhile prizes given at the glider meet.

But why should the government issue glider plans when many small companies were already engaged not only in the design and in the building of motorless craft, but also in the preparing of splendid plans for amateur constructors? Would not the government thereby enter into competition with a worthwhile group of its own citizens?

One governmental activity, however, which would be desirable and free from criticism would be suggestions by the Weather Bureau or the Air Commerce Bureau as to likely glider sites in various sections of the country.

REDUCTION OF AIRLINE FARES

Quite recently, Mr. Jack Frye, President of T. W. A., announced that on November 1st new passenger rates would be effective, bringing the cost of travel on the airlines about to the level of ordinary railroad fares and considerably below extra fare train costs. T. W. A., as most of the country's airline operators, are apt to lose money in cold weather when passenger traffic takes a plunge from summer peaks. It is therefore likely that the T. W. A. reduction in fares will be followed by American Air Lines and United Airlines, the other transcontinental operators.

The Board thought this was a very interesting example of the alertness and energy of our operators and thought it would be presumptuous to comment on what was, after all, a matter of business policy. Reed Chambers voiced a warning, however. "Travelers on the airlines are concerned primarily with speed and are willing to pay for high speed," said Mr. Chambers. "The reduction in rates might bring a little extra traffic, but it might be hard to raise the rates later on when the warm weather comes."

RELEASE OF CRASH DATA BY THE DEPARTMENT OF COMMERCE

Ray W. Bowman suggested this topic. The Board suggested that reports might appear a good deal sooner after the accidents than they do at present, and the Department might, since it acts both as investigator and judge, be less critical of the airlines and pilots and more critical of its own share in such accidents.

CRITICAL REJOINDER TO AN ARTICLE IN POPULAR AVIATION

While the proceedings of the Air Board appear in POPULAR AVIATION, the Board is entirely independent of both editorial and publishing policies of this magazine. The following is an example of this independence of action. In the October issue of POPULAR AVIATION there appeared an article by Max Karant entitled "The Unbelievable Truth About Hammond's Experimental Plane." As a rejoinder to this article, Captain Depew wrote the following frank letter, which is now published with the endorsement of the Board:

"Unbelievable is right! I am surprised that a magazine of the standing of POPULAR AVIATION would print a story like this. It appears to be inspired propaganda, although this may not be so. It is entirely misleading in that at first it conveys the impression that a man who had never flown an airplane or handled the controls in his life, stepped into it and flew it alone. The whole story is most misleading.

"On page 12 the editor of the magazine states 'our correspondent does not depend upon hearsay—he personally investigated the Hammond plane and, what is more, took off with it, flew it and landed it all alone. And Mr. Karant is not a pilot!'

"That is about as misleading a statement as could be made because he did not take off, fly it, and land it alone. He states in his own story that he was accompanied by Mr. Geisse. He spends about two pages of space talking about the 'ravings of authorities' and talks about the 'gotta-fill-so-much-space-this-month writers' and what is he doing.

"The captions of the pictures would indicate something little short of a miracle if taken literally. The fact is Mr. Karant went up in the airplane accompanied by Mr. Geisse.

"It is no doubt true that Mr. Karant handled the controls during take-off, flying, and landing, but there is a vast difference between having a pilot sitting beside you telling you just when to pull back on the stick or being up entirely alone.

"It is true that the Hammond airplane has certain features which are interesting and worth while. One of these is the design of the landing gear with a very long travel, enabling it to be slammed on the ground without much skill and without disastrous results.

"Having myself flown this airplane, accompanied by Mr. Geisse, I consider the stalling characteristics considerably inferior to certain other standard types of modern airplane and certainly the performance, that is, the take-off distance, the rate of climb, and the speed is far inferior to orthodox types of the same or less horsepower.

"While it does have, as mentioned, several very good features, including excellent vision, it also has some very objectionable ones. When in a steep turn there is tremendous shaking which feels like buffeting on the tail.

"As far as the marvelous ability to do turns with only the ailerons, I should be delighted to show the same thing to Mr. Karant on another orthodox make of airplane in general use.

END

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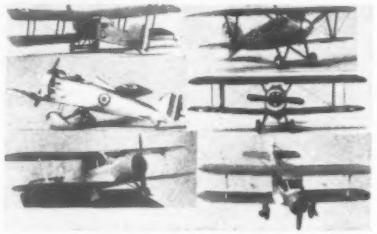

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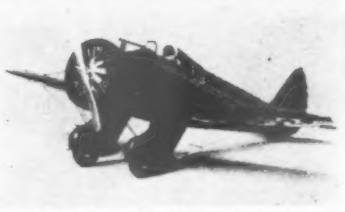

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International

(*Continued from page 26*)

ritory and which could take action at the request of the majority of these countries.

"It is the opinion of the most eminent aviators in the world that a United Police Force would go far toward the solution of the problems that are so disturbing the world," said Harmon in explanation of the action of the League of Aviators. "Millions of people in scores of nations believe that the League of Nations has failed either because it was inefficient or that minds were not ripe for its idealist efforts. Opportunities were afforded it to become a real force for peace—but the waiting world has been disillusioned."

"Now when everyone is haunted by the dangers of the most horrible of wars is the time to find some means of reinforcing the League of Nations," he continued. "Why not try an international air force? If nations knew that such a United Air Force for Peace and Defense did exist they would hesitate to continue their preparation for a war.

Such an international force would have greater resources at its command than those of any several nations, and were the majority of the nations to declare sanctions it would automatically mean that a majority air force could be mobilized."

END

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2" x 3"	1 for	.25
2" x 6"	1 for	.45
3" x 3"	1 for	.40
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For ⅜"or1" wheel 15c
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3/32" O.D.	per ft.	7c
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¾" dia.	pr.....	5c
1" dia.	pr.....	7c
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2" dia.	.....	23c
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CELLULOID MOTOR AND DRAG RING COMBINED

1½" dia.	...each	.18
3" dia.	.....each	.35

CAST PEDESTALS
for all size solid models
Each 10c

MODEL BUILDERS RAZOR KNIFE
Each 10c

BOMBS

¾" long	.....	4c ea.
1¼" long	.....	9c ea.
3" long	.....	14c ea.

2 BLADED PROPS

1½"	.....	9c ea.
2½"	.....	14c ea.
3½"	.....	18c ea.
4½"	.....	20c ea.

BAMBOO PAPER
2 sheets for..... .15

3 BLADED PROPS

1½"	.....10c ea.
2½"	.....15c ea.
3½"	.....20c ea.
4½"	.....25c ea.

PURSUIT MACHINE GUNS

	ea.
⅝" Pursuit Gun	5c
1" Pursuit Gun	5c
1⅜" Pursuit Gun	10c

SWIVEL GUNS

⅜" long.....	5c ea.
½" long.....	5c ea.
1⅜" long.....	10c ea.

DIE CAST WING AND TAIL LIGHTS
3 pc. to a set, for
12" model...10c ea.
15" model...20c ea.
24" model...30c ea.

MOTOR NOSE PLATES
For 1⅛" motor 10c ea.
For 2" motor 15c ea.
For 3" motor 20c ea.

ALUMINUM COWLINGS

Size	drag	Open	Closed
	Anti-		
1½"	20c	20c	20c
2"	25c	25c	25c
2½"	28c	30c	30c
3"	30c	35c	35c

BALSA PROPS

5"	5c
6"	6c
7"	7c
8"	8c
10"	10c
12"	12c

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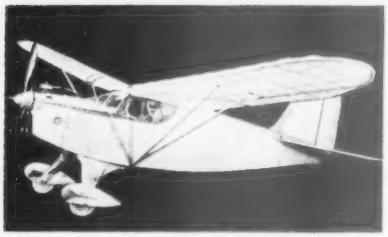

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Big Value Kit with Many Special Fittings

This Kit is complete with every item required, including Cork-Aluminum Balloon Tire Wheels, 12 in. Mahogany-finished "IMP" Propeller, fully finished, "IMP" Propeller Shaft, Cork-Aluminum Skid Wheel, Soft, Medium and Hard Balsa Wood, fully shaped Wheel Cowlings, Wire, Cement, Celluloid, covering Paper and everything else, including Complete Plan in Full Size with Details in Accurate Scale.

Complete Kit only $5.00
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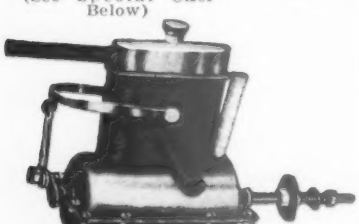

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Model S-2 "IMP" Tornado Motor; 2 Cylinder. Weight 2½ oz. Flies Models 3 to 6 ft. size. Complete with Generator, Feed Line and Safety Clip **$5.00**
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Stress Analysis

(*Continued from page* 42)

viously did not take into consideration the fact of whether there is compression on top or on the bottom of the section. In a metal fuselage there are two neutral axes; one gives compression on the top and tension on the bottom. The other axis gives compression on the bottom and tension on the top.

The reason for this is that to the area of the longerons (all longerons from the compression on top neutral axis, if compression on top is being considered) is added thirty times the skin thickness. The entire skin is considered acting on the tension side. It will be noticed that the skin is at an angle on the top and bottom. The formula for calculating the I_{so} of the skin is $bh^3/12 \times \sin^2 \alpha$ in which α is the angle of inclination between the skin and a line parallel to the neutral axis.

The method of calculating the I of a fuselage section, as shown in figure 8, is done by the use of the formula $I_s = I_{so} + Ad^2$.

A table should be made having the following symbols: (1) Part, (2) Area, (3) Y, (4) AY, (5) h, (6) Ah^2, (7) I_o. Referring to figure 8 the explanation of the symbols is as follows: (1) "Part" means the single longerons; (2) "Area" is the area of the longerons; (3) "Y" represents the perpendicular distance from any outside line (parallel to the neutral axis of the section) to the neutral axis of the longeron; (4) "AY" is (2) multiplied by (3); (5) "h" being the perpendicular distance between the neutral axis of the complete section to the neutral axis of the longeron; (6) "Ah^2" is (2) multiplied by the square of (5); and (7) "I_o" is the moment of Inertia of the longeron with respect to its own neutral axis.

By dividing (4) by (2) we obtain the position of the neutral axis. The sum of column (6) and (7) give us the total I of the fuselage section.

The skin of the curved section is straightened out and put into an approximate position so as to obtain an average angle of inclination (α).

Tables I and II in combination with figure 8 gives a very complete example illustrating the calculation of the I of a fuselage section. It would be very wise to follow every step carefully.

It will be noticed that the neutral axis for both compression on top and bottom are in approximately the same place. This is due to the fact that there are so few longerons in the example given. The axes will spread apart if more longerons are placed into the section.

Although the example cited was for a fuselage section, the same method applies to finding the I of a wing section.

TABLE II
COMPRESSION ON TOP

PART	AREA	Y	AY	h	Ah^2	I_o
No. 1	.464	5.60	2.6	8.52	33.62	SMALL
No. 2	.464	7.56	3.507	20.28	191	"
No. 3	.464	7.56	3.507	20.28	191	"
No. 4	.464	5.60	2.6	8.52	33.62	"
No. 5	.440	2.75	2.21	8.58	32.40	"
No. 6	.440	.81	.356	20.22	180.6	"
No. 7	.440	.81	.356	20.22	180.6	"
No. 8	.440	2.75	1.21	8.58	32.40	"
C	.04	1.34	.0536	2.84	.3224	6.67
D	.04	1.34	.0536	2.84	.3224	6.67
Total	3.696	4.18	15.4532		875.8848	13.34

(Slide Rule Accuracy)

Japanese Airmail Organization

(*Continued from page* 38)

The Communication Department have decided on the subsidy for these scheduled new lines and the test flights planned.

Daihoku-Bankok Line	Test flights	¥240,000.00
	Subsidy for 10 years	¥7,488,000.00
Tokyo-Parao (South Seas) Line	Investigation of air-line	¥5,500.00
Tokyo-Sapporo Line	Test flights	¥110,000.00
	Subsidy for 10 years	¥4,000,000.00
Fukuoka-Shanghai Line	Part of the subsidy granted	¥350,000.00

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Founded 1909

Fleetwings

(*Continued from page 30*)

self, carefully designed for quick take-off and dryness, is the only water resistance to acceleration in taking off.

Even the tail wheel is completely retractable to avoid drag, and when it is down it can be used as a water rudder.

The Fleetwings Sea Bird is equipped with flying instruments suitable for blind flying for, with its many safety features, the owner may wish to do more blind flying than he would care to do with only a seaplane or a land airplane. A valuable instrument, in addition to the usual complete conventional instrument board, is a rate-of-flow meter indicating the rate of fuel consumption visually to the pilot at all times.

Direct electric starting of the motor adds another modern convenience unknown to sportsman pilots a few years ago. Landing lights can be retracted into the wings so that they are complete streamlined when not in use. The windshield is of a new nonbreakable material which will not discolor or become opaque and which has a transparency seven per cent greater than glass.

Comfort has been as carefully considered as the refinements of design and performance. Between the propeller tips and the hull there is ample clearance to avoid the usual noisy beat which is so objectionable when the propeller revolves too close to the hull. The location of the engine and propeller, mounted above the wing, further reduces noise and vastly improves the vision ahead. In addition the cabin has been sound-proofed so that the noise level is reduced below 80 decibels to about the quietness one experiences riding in a railroad Pullman car.

The four seats are deeply upholstered in a beautiful modern upholstery cloth such as is used in expensive custom-built limousines.

The shiny stainless steel hull of the plane has been beautifully finished in circular knurls which give a hitherto unobtained metallic richness of appearance. The wings, covered with airplane cloth, are finished in a silver color which blends with the stainless steel.

From tip to tip of the non-tapered monoplane wing, the Fleetwings Sea Bird measures 40 ft., 6 in., conveniently small enough for maneuvering in the small harbors a sportsman pilot likes to visit. Her length overall from the cockboard bumper on the bow to the edge of the rudder at the stern is 31 ft. 5½ in. The wing area is 235 sq. ft., which gives a wing loading of 14.6 lb. per sq. ft.

With landing gear down, the plane lands on wheels widely spaced at 7 ft., 8 in. tread and will roll through a 23 ft. high door easily for the maximum height with propeller horizontal is only 12 ft. 6 in.

Although not the first stainless steel plane, the Sea Bird is the first built for other than experimental purposes and the first especially designed for this type of construction. In 1931, the Budd Company, copying a wooden plane, built the stainless steel Pioneer which was flown more than 1,000 hours. Three years later the Savoia Marchetti Company, Budd licensee in Italy, constructed a larger and more powerful version of the Pioneer to check it against the known performance of the same model in wood.

Although no price has been announced on the Fleetwings Sea Bird, its builders say the price will not be high for the advantages it offers.

Design of the ship is the work of Mr. de Ganahl and Wilson L. Sutton, vice president and chief engineer of the company.

END

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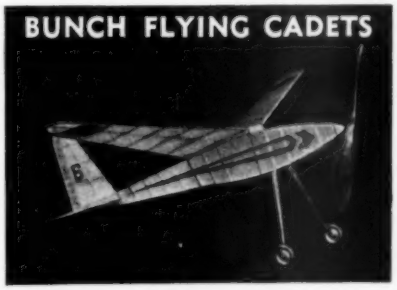

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With all orders for $1.00 or over—your choice of only one of these FREE OFFERS:

1. 2 oz. clear cement and 100 1/16 x 1/16 x 18 balsa.
2. 50-ft. 1/8 flat rubber.
3. 3 sheets silver tissue.
4. 1 skein 1/8 flat rubber. Add 15c packing charge for Free Offer No. 4.

18" BALSA

1/16x1/16, 100, 5c
1/16x1/8 40 for 5c
1/16x3/16, 20, 5c
1/16x1/4 16 for 5c
1/16x1/2 5 for 5c
3/32x3/32 32, 5c
1/8x1/8 30 for 5c
1/8x3/16 15 for 5c
1/8x1/4 10 for 5c
3/16x3/16 8, 5c
1/4x1/4 6 for 5c
1/4x1/8 3 for 5c
1/2x1/2 2 for 5c
1/32x2 8 for 10c
1/16x2 8 for 10c
3/32x2 7 for 10c
1/8x2 6 for 10c
3/16x2 3 for 9c
1/4x2 3 for 10c
3" sheets or 36" lengths, double above prices, add 10c packing chge. for 36" lengths.

18" PLANKS

1x1 4c; 1/2x2 6c
1x1 1/2 8c; 1x2 10c
1x3 15c; 2x2 18c
2x3 23c; 2x6 35c
3x3 40c; 3x6 75c

TISSUE, AA

All col., doz. 18c
Sliver.....ea. 5c
Superfine, white 5c

WHEELS per pr.

Birch. Blsa Cel.
1/2 .01 .02 ..
3/4 .02 .03 .05
1 .03 .04 .07
1 1/2 .04 .06 .10
1 3/4 .07 .08 .16
3 .. .15 .30

PINE WHLS., pr.

Both sides alike
3/4" 4c; 1" 6c
1 3/4" 8c; 1 7/8" 12c

WASHERS

1 doz. 1/8 or 1/4 1c

THRUST BEARINGS

Small ..doz. 8c
Large ..doz. 12c

PROPELLER BLOCKS

1/2x 3/4x 5 8—5c
1/2x 3/4x 6 6—5c
3/8x1 x 7 4—5c
3/4x1 x 8 3—5c
3/4x1 1/4x10 2—5c
3/4x1 1/4x12 3c ea.
1 x1 1/2x12 4c ea.
1 x1 1/2x15 6c ea.

SHEET ALUMINUM

.0003x3 1/2 ..ft. 1c
.005 in. 6x6 5c
.010 in. 6x6 6c

SPECIAL HARD BALSA FOR GAS MODELS

Lengths 36"		54"		Sheets 36"	54"
1/8 sq.	10—5c	6—5c	1/8 sq.	2—10c	2—15c
3/16 sq.	3—5c	2—5c	3/16 sq.	2—14c	2—21c
1/4 sq.	2—5c	1—5c	1/4 sq.	2—15c	2—25c
1/2 sq.	1—5c	1—7c	1/2 sq.	1—15c	1—25c
3/8 sq.	1—6c	1—9c	3/8 sq.	1—20c	1—33c
3/4 sq.	1—10c	1—15c	3/4 sq.	1—25c	1—40c

.6" lengths, add 10c packing charge, 54" lengths, add 25c packing charge. 3" Sheets double above prices.

MACHINE-CUT BALSA PROPS

5" 4c; 6" 5c;
7" 6c; 8" 7c;
10" 8c; 12" 10c.
15" 15c

GUNS WITH RING MOUNT

1 3/4" 10c 1 3/4" 15c

PURSUIT MACH. GUNS

3/4", 1 1/4" or 1 3/4", each 5c

NOSE PLUGS

1/2".....doz. 8c

BUSHINGS

1/16....4 for 1c

WOND. WATER SPRAYER 15c

20 IN. FLYING PLANS 10c—3 for 25c

Sparrow Hawk, Boeing Trans. 247, Spad Chass., Vought Corsair, Curtiss Swift L. W., Waco Cabin Biplane, Douglas Dolphin, Boeing P12F, Fokker D-VII, S.E.5, Goshawk, Gee Bee, Boeing P26A, Monocoupe, Northrop Gamma, Fairchild 24 Cabin.

SELECT ANY 2 OF THE ABOVE PLANES in 2-in-one FLYING KIT

with carved prop, complete. Postpaid in U.S.A. (Free offer will not be included with 2-in-1 kits unless order amounts to $1.50 or over.) **75c**

36" CORBEN SUPER ACE FOKKER D-VII 75c
Complete. Add 20c postage.

KITS CURTISS GOSHAWK $1.00
Add 25c postage

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SEND FOR FREE CATALOG
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RUBBER

.045 ....25 ft. 5c
1/16 sq., 20 ft. 5c
1/8 flat..18 ft. 5c
Skein 50c

DUMMY RAD. ENGINE

1 1/2" d. 10c; 2" d. 15c; 3" d. 20c.

ENGINE AND COWL ATTACHED

1 1/2" dia. 20c
3" dia. 35c

CELLULOID PANTS, per pair

1/2" to 1" .18c
1 3/8" to 1 7/8" .33c

METAL PROPELLERS

2 blades 3 blades
1 1/2" ..5c 08
2 1/2" .10c 10
3 1/2" .15c 20
4 1/2" .20c 25

SANDPAPER

Doz. sheets....5c

BOMBS

1/4"..4c 1 1/2"..7c
3"..12c

CELLULOID

6x8 ..... 5c
12 1/2x16 .....18c

WING AND TAIL LIGHTS

12" 10c; 15" 15c; 24" 20c.

NOSE BLOCKS

1x2x1 .....1c
2x2x1 .....2c
2x2 1/2x1 .....3c
3x3x1 .....5c
3x3x2 .....8c
3x3x3 .....10c

INSIGNIA

24 and stripes 5c

ALUM. TUBING

1/16 or 1/8, ft. 7c
3/16 or 1/4, ft. 10c

ALUM. COWLINGS

1 1/2" 15c 2" 18c
3" 25c
Specify whether anti-drag, closed, or open.

REED

1/32-1/16-1/8, ...2 for 1c

MODEL PINS

pkg. 1/2" or 1" 5c

COLORED DOPE

1 oz. 5c; 2 oz. 9c; 4 oz. 17c; 1/2 pt. 35c; pt. 55c.

CLEAR CEMENT

1 oz. 5c; 2 oz. 9c; 4 oz. 17c; 1/2 pt. 30c; pt. 50c.

CLEAR DOPE

1 oz. 5c; 2 oz. 9c; 4 oz. 17c; 1/2 pt. 25c; pt. 45c.

THINNER

Same as clear dope.

BAMBOO

1/16 sq. x 12, 36, 5c
1/16x1/4x15, ...doz. 10c

DOWELS

1/16x6 ...doz. 5c
1/8x18 ...2 for 3c

WIRE

6-8-10-12-14 .....2 ft. 1c

WOOD VENEER PAPER

20x30 ..1 for 10c

PROP. SHAFTS.

doz. 8c

CAMEL'S HAIR BRUSHES

Small 3c; Lge. 5c

Hawks

(*Continued from page* 43)

ing flaps, 65 to 68 miles an hour. The wing flaps also cut down gliding angle.

The ship has a terminal velocity, in a power dive, of 750 miles an hour.

The engine mounting is built with sufficient sturdiness to accommodate an engine of 2,000 horsepower, when such a compact power plant is available.

The propeller is a Hamilton standard three bladed, constant speed, 10 feet, 6 inches in diameter.

The ship carries a 230 gallon gasoline tank, forward of the cabin, giving a range of 1,700 miles. Just aft of the engine is an oil tank of 25 gallons capacity. Aft of this oil tank is a protective fire-proof partition. The ship has a safety factor of 12, which meets military pursuit requirements.

The landing gear is full retractable, manually operated for certainty of operation, although the belly of the fuselage is strongly reinforced against an emergency landing without wheels.

END

Canada

(*Continued from page* 18)

route will be the route of the prairie mail service discontinued a few years ago, through Brandon, Regina, Piapot, Calgary to Lethbridge and a northern feeder to Edmonton.

Through the mountains the planes will speed through the lowest passes via Cranbrook and Princeton to Vancouver, following closely the international boundary.

Along the entire route emergency landing fields have been built, most of which have but to be fitted with lights and radio stations, to place them in readiness. Some still have to be finished.

At the main fields will be weather stations, and near the main fields will be 25 radio direction finders and radio beams to guide the planes through all kinds of weather. Two such beams are now operating at Montreal and Ottawa. On the prairies the equipment used when the route was open, has but to be connected again. In the mountains there will be extra radio beams to guide the planes through the snowcapped peaks. All the fields will be connected by telephone.

While a decision is pending in Ottawa on who will run the air mail planes, the consensus in aviation circles is that one or more private companies will get the contract on a mileage basis, and that the government through the Signal Corps or the Ministry of Transport will operate the ground service safety aids, as they do in the Mackenzie River airway. Planes for the work will have to be of the latest types doing upwards of 200 miles an hour to make the run in contact time.

It will take some time to get the route functioning smoothly, but it will serve not only Canada's mail needs, but also it is hoped the trans-Atlantic and trans-Pacific mail from ships and the planes which will soon be winging across the Atlantic and Pacific on scheduled runs, a service where Canada will have to compete with the already scheduled United States air mail routes.

END

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If 3" widths are desired, double price of 2" widths sheet Balsa. Thinner same price as clear dope.

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1/32x1/16 .....10c
1/16x1/16 .....10c
1/16x3/32 .....18c
1/16x1/8 .....19c
1/16x3/16 .....24c
1/16x1/4 .....26c
1/16x1/2 .....60c
3/32x3/32 .....24c
1/8x1/8 .....29c
1/8x3/16 .....48c
1/8x1/4 .....52c
3/16x3/16 .....65c
1/4x1/4 .....80c
1/4x1/2 .....$1.50
1/2x1/2 ..... 2.15

36" PLANS

Scale craft flyer plans with movable controls: Post-Rogers Lockheed or the Monocoupe. $1.50 per doz. or $9.00 per hundred.

36" SHEETS

1/64x2 .....10 for 14c
1/32x2 .....10 for 14c
1/16x2 .....10 for 17c
3/32x2 .....10 for 20c
1/8x2 .....10 for 22c
3/16x2 .....10 for 31c
1/4x2 .....10 for 40c
½x2 .....10 for 75c

BALSA PLANKS 36" Lengths

1x1, each 6c
1x1½, each 9c
1x2, each 13c
1x3, each 20c
1x6, each 35c
1½x1½, each 25c
2x2, each 25c
2x3, each 35c
2x4, each 45c
2x6, each 60c
3x6, each $1.25

COLORLESS CEMENT

1-oz. bots., ½ doz.23c
2-oz. bots., ½ doz.40c
4-oz. bots., ½ doz.70c
1 pt., each 45c
1 qt., each 75c
1 gallon, each ..$2.00

CLEAR DOPE OR BANANA OIL

1-oz. bots., ½ doz.23c
2-oz. bots., ½ doz.40c
4-oz. bots., ½ doz.70c
1 pt., each 40c
1 qt., each 65c
1 gal., each $1.75
Thinner same price as clear dope.

JAPANESE TISSUE

White, per doz...12c
Colored, asst., per doz. 15c
All colors.
Silver, per doz...21c

For a short time only, we have cut our prices on die-cast parts. We are doing this for the sole purpose of acquainting new customers and friends with our products. We feel sure that once these friends get to know the DIAMOND quality, they will stick by us forever. Time and again, dealers have written us commending us on our services, prices, and quality. You, too, can feel the utmost in security if you deal with a reliable supply house.
Don't hesitate. Order NOW while prices are lowest.

STANDARD PITCH BALSA PROPELLER BLOCKS Per Dozen

½x¾x5 ..... 5c
½x¾x6 ..... 6c
⅝x1x7 .....14c
⅝x1x8 .....18c
⅝x1x9 .....25c
¾x1¼x10 .....30c
¾x1¼x12 .....35c
1x1½x12 .....40c
1x1½x15 .....55c

BAMBOO

1/16 sq. x 14, 1 gross for 10c
1/16x¼x11, 1 doz. for 5c

REED

1/32 or 1/16 dia., 50 ft. for 18c
3/32 or ⅛ dia., 50 ft. for 20c

ALUMINUM COWLING Closed or Open

1½" dia., 3 for..25c
2" dia., 3 for..35c
2½" dia., 3 for..43
3" dia., 3 for..55c
4" dia., 3 for..80c

FRESH PARA RUBBER AAA GRADE

Per 225' skein
1/32 sq. 25c
.045 sq. 35c
3/32 flat 35c
1/8 flat 40c
3/16 flat 70c
1 lb., any size.$1.00

DOWELS

1/16" dia. x 12", 100 for 55c
25 for 20c
⅛" dia. x 36", 100 for $1.50
25 for 45c
3/16" dia. x 36", 100 for $2.25
25 for 75c
¼" dia. x 36", 100 for $3.00
25 for 1.00

SHEET CELLULOID

(Transparent)
12½x16, each 19c
6x8, doz 65c

INSIGNIA SHEET

12 pr. & rudder and tail markings with gummed back. Doz., 36c; 100, $1.75

DUMMY RADIAL ENGINES

(Celluloid 9 cylinders)
1½" dia., ½ doz. for 80c
2" dia., 3 for....65c
3" dia., 3 for....85c

CELLULOID MOTOR AND DRAG RING COMBINED

1½" dia., 3 for..40c
3" dia., 3 for....75c

NOSEPLUGS, HARDWOOD

1 doz. 5c
100 .....40c

CELLULOID WHEELS

¾" dia., per doz.24c
1" dia., per doz.25c
1¼" dia., per doz.35c
1⅞" dia., per doz.60c

BALSA BALLOON WHEELS

(Machine Turned)
½" dia., per doz. 9c
¾" dia., per doz.11c
1" dia., per doz.14c
1¼" dia., per doz.19c
1⅞" dia., per doz.38c
3" dia., per doz.85c

BIRCH WHEELS LIGHT AND STRONG

½" .....per doz. 5c
¾" .....per doz. 6c
1" .....per doz. 8c
1¼" .....per doz. 10c
1⅞" .....per doz. 15c

BRASS BUSHINGS OR EYELETS

Per 100
1/16 diam. 12c
3/32 diam. 15c
⅛ diam. 18c

THRUST BEARINGS (Hard Steel)

Small, per dozen. 6c
Small, per gross..55c
Large, per dozen. 7c
Large, per gross. 70c

WASHERS PER 100

¼ brass O. D. 5c
¼ copper O. D. 5c

WIRE PER 100 FT. (Straight Lengths)

No. 6 .....15c
No. 8 .....18c
No. 10 .....20c
No. 12 .....23c
No. 14 .....26c

SHEET ALUMINUM Per 5 ft.

.002 thick 35c
.005 thick 50c
.010 thick 75c

ALUMINUM TUBING

(Special 1/100" wall)
1/16 O.D., 5 ft...30c
3/32 O.D., 5 ft...32c
⅛ O.D., 5 ft....32c
3/16 O.D., 5 ft...40c
¼ O.D., 5 ft.....45c

COLORED DOPE

White, yellow, orange, blue, red, green, olive drab, black, silver, gold or gray.
1-oz. bottles, per ½ doz. 30c
2-oz. bottles, per ½ doz. 55c
4-oz. bottles, per ½ doz. $1.00
1 pt. each 50c
1 qt. each 85c
1 gallon, each..$2.25

SANDPAPER 5 Pieces to the Pack

Per doz. pkgs....25c

HIGH GLOSS

To shine up colored models.
1-oz. bottles, per ½ doz. 30c
2-oz. bottles, per ½ doz. 55c
4-oz. bottles, per ½ doz. $1.00

CELLULOID PANTS

For ¾" or 1" wheels, ½ doz. .50c
For 1⅜" or 1⅞" wheels, ½ doz..75c

¾ FINISHED BALSA WHEEL PANTS

Ready for final sanding
To fit: 6 pr.
½" wheels 36c
¾" wheels 36c
1" wheels 36c
1⅜" wheels 54c
1⅞" wheels 54c

PROP SHAFTS (Hard Steel)

One size fits all models
Per dozen 10c
Per gross 75c

REAR HOOKS (Hard Steel)

One size fits all models
Per dozen 10c
Per gross 75c

DIE-CAST BOMBS

⅜" long, 3 for...7c
1¼" long, 3 for..17c
3" long, 3 for..30c

PURSUIT or SWIVEL MACHINE GUNS (DIE CAST)

⅜" long, 3 for...6c
1½" long, 3 for..11c
1⅝" long, 3 for..16c

2-BLADED PROPS (DIE CAST)

1½" long, 3 for..16c
2½" long, 3 for..22c
3½" long, 3 for..26c
4½" long, 3 for..31c

3-BLADED PROPS (DIE CAST)

1½" long, 3 for..20c
2½" long, 3 for..26c
3½" long, 3 for..31c
4½" long, 3 for..41c

DIE-CAST WING AND TAIL LIGHTS 3 Pcs. to a Set

For 12" model, 3 sets 15c
For 15" model, 3 sets 25c
For 24" model, 3 sets 35c

MODEL PINS

Per doz. pkgs....35c

MACHINE CUT PROPS

5".....per doz. 22c
6".....per doz. 25c
7".....per doz. 35c
8".....per doz. 38c
9".....per doz. 40c
10".....per doz. 50c
12".....per doz. 60c

WOOD VENEER (For scale model work)

20"x30", 3 sheets for 25c

GENUINE SUPER-FINE TISSUE

(Cover your champion endurance ships with this paper.)
18x24, per doz....50c

ALUMINUM LEAF

.0003 of an inch thick
3½" wide, 100 ft. for 35c

FRESH RUBBER A GRADE

3/32 flat, skein 250 ft. 20c
⅛ flat, skein 250 ft. 25c

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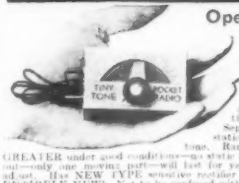

Operates without tubes or batteries

Amazing midget radio fits in pocket or purse. NEW MODEL weighs only 2 ozs. as shown in ACTUAL photo! Smaller than a cigarette package! Separates and receives all stations with beautiful clear tone. Range to 50 miles—MUCH GREATER under good conditions—no static or noise! Nothing to wear out—only one moving part—will last for years. NO CRYSTALS to adjust. Has NEW TYPE sensitive rectifier and high efficiency design—ENTIRELY NEW! Not to be confused with cheap imitations. Tunes broadcast band and POLICE and AIRPLANE calls! NOT A TOY, but an unusual practical radio—a sensation everywhere—a delight to anyone everyway. Comes in several beautiful colors (state yours) ABSOLUTELY COMPLETE ready to listen with midget phone and instructions to use in hotels, offices, autos, trains, camps, at home, in bed, on bicycles, on sea or wherever you may be. TAKES ONLY A SECOND TO CONNECT—no screw drivers. THOUSANDS OF SATISFIED OWNERS—many report wonderful service in ALL PARTS OF THE WORLD! THESE ARE FACTS! Carry one with you always and be assured of many hours of entertainment AT NO COST! Can be used by ANYONE—even a child! Send only $1.00—pay postman balance of $1.00 plus few cents postage, or send $2.00 M.O. Cash, Check. WE PAY POSTAGE. GUARANTEED. A most unusual value. Foreign orders 75c extra.

SEND ONLY $1.00

TINY TONE RADIO CO., Dept. PA-12, Kearney, Nebr.

XUM

Aircraft Metals

(*Continued from page 38*)

one which tends to crush the material under pressure. Another stress known as sheer is one which has a tendency to slide fibers of the material over adjacent fibers.

One of the stresses which causes a great deal of trouble is the bending stress. If a structural member or portion of one used in aircraft construction curves under pressure, it is termed to be subjected to the bending stress.

In aircraft construction the use of alloys is one of the most important factors that has so far been discovered. Taking steel as an example, it is known that all steels contain a small amount of other elements; for example, they possess carbon, nickel, vanadium, and chromium. Whenever the amount of one or more of these elements is great enough to affect the physical properties of these steels, it is said to be alloyed with these elements.

In the structural design of aircraft where a great strength-weight ratio is vital, alloyed steels have replaced practically all of the former mild steels and wood which was formerly used in aircraft construction.

One of the steel alloys most widely used in present day aircraft construction is Chrome-molybdenum. The chromium generally uses from one to two percent chrome in its alloys. It can be readily hardened and is well adapted to the uses to which it is put.

When Molybdenum is also used in these alloys it increases the hardness of the steel and also increases the tensile strength and resistance to shocks. This alloy, by the way, is the only one of its kind, except carbon, which is produced extensively in the United States. In the western part of the country there are a great many Molybdenum mines now operating.

The Society of Automotive Engineers Specification has numbered the alloys of steel in accordance with their percentage of predominant alloying element.

Number	Name	Steel Alloys Carbon Content
71660	Tungsten Steel 16%	0.50-0.70%
2330	Nickel Steel 3%	0.25-0.35%
1025	Carbon Steel	0.20-0.30%

Steel in many forms is now being used in the aircraft industry. There are many kinds and grades of steels, each having its own peculiarities or characteristic properties which make it adaptable for the particular use or part of the airplane in which it is used. These steels used in aircraft construction range in strength from around 55,000 pounds per square inch to about 250,000 pounds per square inch.

Besides the use of steels there are several different aluminum alloys now being used quite extensively. Pure aluminum is about one-sixth as strong as a mild steel, but by using alloys and being heat treated this strength is increased to equal that of a mild steel.

Duraluminum in combination with other aluminum alloys has a variety of uses in the modern airplane. On the later models such as the Boeing 247-D transport, the new Douglas transports and many other types of aircraft, metal is used exclusively in the construction. By these means they have turned out a more compact, stronger airplane with a higher strength-weight ratio and a greater margin of safety than ever before.

Both here in the United States and in Europe the greatest scientists of the day are constantly endeavoring to produce even a finer metal for the use of aircraft construction.

This metal will have to be lighter in weight, simple to alloy without going to a great expense, and have a much higher strength-weight ratio than any of the present day metals. When the secret of this new metal is discovered it will revolutionize the whole aircraft industry. We will have airplanes which will have a much higher speed, a greater degree of efficiency and safety, and will far outclass the present day airplane.

The bottom of metallurgy has not yet been touched and great progress has been made during the past few years in the development of structural metals for different purposes. It might be said that this is the "alloy age," an era fully as important as the Stone Age or the Copper Age. Ten years will probably see revolutionary discoveries in materials.

Metallurgy is the real father of the automobile and for industry in general, for the necessity for stronger, lighter and more resistant metals for motor car service brought us such alloys as chrome-nickel, vanadium, molybdenum and all the other steels of prime importance today.

END

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Actual Photograph of the D.E.L. Model

Span 34¼"	Sikorsky S-42	$6.75
" 17⅜"	Sikorsky S-42	1.75
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" 17⅜"	Martin Bomber	1.75
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1/32x2 ..... 5 for 5c
1/16x2 ..... 5 for 5c
3/32x2 ..... 4 for 5c
⅛x2 ..... 4 for 5c
3/16x2 ..... 3 for 5c
¼x2 ..... 2 for 5c
½x2 ..... 1 for 5c
For 3" Sheets, double above prices.

BALSA PROP BLOCKS
¼x¾x6 ..... 6 for 5c
½x¾x5 ..... 7 for 5c
⅝x1x8 ..... 3 for 5c
¾x1x8 ..... 3 for 5c
¾x1¼x12 ..... 2 for 6c
1x1½x12 ..... 1 for 6c
1x1½x15 ..... 1 for 7c
For 36" lengths double above prices and add 10c postage

15" BAMBOO
1/16x¼..6 for 5c
Shredded..40, 5c

Japanese Tissue
All colors. Dz. 16c
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Doz. 50c

Thinner Best
1 oz. 5c

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18" BALSA PLANKS
1x1. 1 for 4c
1x2. 1 for 9c
2x2. 1 for 15c
2x3. 1 for 19c
2x6. 1 for 35c

Sheet Celluloid
2x6 ..... 2c
6x8 ..... 4c
12x16 ..... 15c

Clear Dope
1 oz. 5c
½ pt. 25c

Colored Dope
1 oz. 5c
½ pt. 30c

Clear Cement
1 oz. 5c
½ pt. 25c
1 pt. 45c

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20x30". 1 for.. 9c
2 for 17c

Reed
1/32, 1/16"
3 ft. 1c
3 for 2c

Wooden Wheels
½". 2 pair..3c
⅝". pair..2c
1". pair..4c
1⅜". pair..4c
1¾". pair..7c

Celluloid Wheels
¾". pair..5c
1". pair..7c
1⅜". pair..9c
1⅞". pair..15c

Balsa Balloon Wheels
½". 2 pair..3c
⅝". pair..2c
1". pair..3c
1⅜". pair..5c
2". pair..8c
3". pair..14c

PROP. SHAFTS, 2 for....1c

PAUL-O-WINA JAP PROPS
5". 10c
(add 5c per inch for props up to 10".)

Machine Props
5" 4c
(add 1c per inch for props up to 16".)

Rubber Motors
1 16 sq. 20 ft. 5c
⅛ flat...20 ft. 5c

INSIGNIAS—
French, American, English, German
1¼"...4 for 3c
2" 1c
1 sheet of 24, 5c

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1½" Diam...14c
2" Diam...18c
3" Diam...23c

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1⅜". ..... pr. 11c
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Alum. Tubing 1/16", 3/16", ¼". ....10c ft.
ALUM. LEAF, 2 sheets for 1c
WIRE, 6 ft. 3c
36" lengths.
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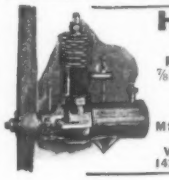

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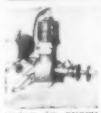

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Max Karant

(*Continued from page* 46)

as the Bureau may be in other respects they still have developed and built an airplane that has performance characteristics far ahead of anything flying today. *That is the issue.*

Tsk! Tsk! My oh my! So the industry has a terrific investment to protect! And because said industry has so much money involved the manufacturers, according to your way of thinking, Swanee, have all the right in the world to whimper and whine. Granted. Well, I'm not much of a gambler, Swanee, but I'll bet you a heaping big pile of campaign buttons that when the Stearman-Hammond company puts its Model L on the market, many a plane manufacturer is going to do some quick thinking and revising.

Of course, in all this controversy I'm referring strictly to the private airplane manufacturing branch of the industry. I'm not concerned here with any branch but this. And I say this recognizing the fact that any model of the Hammond to reach the market in the near future will cost more than $700 simply because it will not be at all like the finished product the Bureau development program calls for. Also, how can any rapid advances be made when, for instance, it takes Bureau engineers *one month* of governmental requisitioning and red tape to get nothing more than a new set of tires!

For a man who really knows better, Swanee, your explanation of the safety benefits of an N.A.C.A. cowling was a howl. You don't honestly think I had a bone to pick with N.A.C.A. because of the design of their streamlinings, do you? If I really must explain things to you, Swanee, I merely wrote that that way as a figure of speech. But your great pains to point out that said cowling has safety possibilities when I don't care a hoot whether it does or not is a joke. My bone of contention is the *airplane the cowling is on.* Is that clear enough now, old fellow?

Now comes this important question: *Who am I to compare the Bureau's planes with any conventional ship?* That's one crack you happened to omit, Swanee, but a couple of other veterans-in-a-rut made up for your absence on that point. Well, let's see. Looking back I think I'd be safe in saying I've flown in practically every standard make of airplane on the present market.

I've become intimately acquainted with almost every phase of aviation in my nine years in the aviation industry and long ago came to the conclusion that before you get the majority of present-day would-be pilots and owners in the air you're going to have to do something radical about both the present airplane and its price.

Not that the present products are death traps or anything like it. They are as safe as they possibly can be made in their present form. Why, in the hands of a good pilot practically any licensed airplane on the market today is a lot safer than an automobile ride out in the country. But let me remind you that I said *in the hands of a good pilot.*

Sure, I'd feel perfectly safe in a ship you were flying, Swanee, because you've had years of training and experience. But how about Joe Doakes around the corner from my house who has a nice little wad he'd like to plank down on a ship he could go for a hop in next Sunday morning? Would I ride with him in a present-day standard airplane? What do you think? Engine quit on the takeoff and we'd end up in the hospital. Correct me if I'm wrong.

I see your point in this matter quite perfectly, Swanee. You're convinced that because you can fly any ship within reason today that everything's hunky-dory. Well, I really don't care a continental how many chances you yourself take but I—and plenty of others in these United States—want to do all my flying with the same ease as I did in Washington that July morning.

So now you can go back to your august manufacturers, Swanee, and let them buy you a couple more drinks.

END

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